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ABSTRACT

The problem of allocating funds for teacher salary increases was analyzed using a computer simulation model of the decision process. Data from six suburban school systems were gathered for the study, which attempted to predict salary increases. Numerous tables and charts illustrate study procedures and findings. (LLP)

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TEACHERS' SALARY INCREASES IN A CLUSTER OF SUBURBAN SCHOOL DISTRICTS

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SUMMARY

One of the most timely problems associated with the allocation of financial resources in public education concerns salary increases for teachers. This study analyzes the problem using a computer simulation model of the decision process in a cluster of suburban districts. The model, which makes salary increase predictions, consists of the policies employed by each district to make a decision. Special emphasis is placed on the manner in which the raises in each one affect all the others.

The cluster studied involved six north side systems in Milwaukee County. They represent small, wealthy communities willing to support high cost education. Due to the varied nature of salary increases, concentration was placed on the B.A. Minimum (Bamin) salary. For one reason its raises were associated in many instances with across the board increases throughout the entire schedule. Data came from the 1960/61 through 1968/69 school years.

The following methodology was employed to gather data about decision making. Respondents (board members and superintendents) were asked to remake past Bamin decisions using the same information they had previously employed in the actual situations. An analysis of the sources and content of information was also undertaken. It revealed that the most essential informational inputs to a district were the Bamins of its neighbors in the cluster and Milwaukee.

The overall structure of the model reflects the sequential nature of the decision process. When a system makes a choice its Bamin as well as those chosen earlier become available as inputs to the next district. Milwaukee's salary and the settlement order are not predicted.

The model views each suburb as going through a two-stage process. In the first the school board attempts to structure the situation by determining a range within which the Bamin choice can be made. The most important information for this purpose is the lowest and highest salaries arrived at to date. Suburbs which decide early consider the range as a hazy guideline but those settling after most of the others consider it an inviolable boundary.

Once some idea of the allowable range has been established existing Bamin policy is used to select a particular point within. It was not surprising to learn that policies changed over the time period investigated. These changes seemed to occur in the same year as major revisions in the salary schedule requested by the teachers. Moreover, in that particular year there was a tendency for salary increases to be limited implying a tradeoff between the board and the teachers. Most of the policies represented variations on the theme of emphasizing or deemphasizing the lower end of the schedule relative to the remainder. One of the key reasons for emphasis was large recruiting needs, while deemphasis

was often caused by the presence of many teachers in the upper parts of the schedule.

The model's policies also show the manner in which school boards handle the pressures placed on them by various interest groups. Settling too high with respect to one's neighbors means pressures from other school boards for lower salaries and from citizens for lower taxes. Settling too low causes dissatisfaction among teachers, arouses the superintendent's concern about recruiting, and may force a large increase in the immediate future to catch up. Not wanting to get out of line is reflected in a district's choosing less than the average increase when it currently has one of the highest Bamins and more than the average raise when it currently has one of the lowest. Once more, the use of upper and lower limits on increases and structuring the situation by means of a range also provide examples.

Finally, the model demonstrates how recent events have introduced aspects of a common policy into decision making. The introduction of collective bargaining, teacher militancy, citizen's concern about taxes and primarily extraordinarily large increases by the city of Milwaukee have led the suburbs to select Bamins which are at most somewhat lower than Milwaukee's.

Predictions were tested against actual decisions made from 1960/61 through 1968/69. A regression analysis confirmed that they closely resembled each other. Tests were also made against the predictions of alternative theories. In all cases the model had the lowest errors.

TEACHERS' SALARY INCREASES IN A CLUSTER OF SUBURBAN SCHOOL DISTRICTS*

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One of the most timely problems associated with the allocation of financial resources in public education concerns salary increases for teachers. Most of a typical school system's budget is accounted for by teachers' salaries, while the largest share of any increase in the budget is usually due to the same factor. And these increases have been large in recent years. The average annual salary of the instructional staff (the overwhelming proportion of which is naturally teachers) increased 66 percent, on a calendar year basis, from 1956 to 1966, while the increase for all employees in manufacturing was only 45 percent.[1] Similarly, from 1960 to 1967 the average yearly earnings of classroom teachers increased 50 percent as compared to 30 percent for accountants, 33 percent for attorneys, and 40 percent for engineers.[2] Moreover, the growing militancy of teachers suggests that they expect these trends to continue or perhaps intensify in the near future. Yet, at the same time, increases in tax revenues, especially from the property tax, are meeting with more widespread opposition from citizens. In view of this situation, it seems worthwhile to study, even in a limited manner, the forces which have been shaping the growth of teachers' salaries.

Introduction

In a previous study the author examined the process of budgetary decision making in a large urban public school system.[3] Over a twelve year period (1953 to 1964) the district granted its teachers salary increases four times over and above any raises caused by state regulations. These occurred when and only when no other comparable system

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* The work presented herein was performed pursuant to a Grant from the U.S. Office of Education, Department of Health, Education, and Welfare. However, the opinions expressed herein do not necessarily reflect the position or policy of the U.S. Office of Education, and no official endorsement by the U.S. Office of Education should be inferred.

1 National Education Association, Research Division, Economic Status of the Teaching Profession, 1967-68, Washington, D.C.: The Association, 1968, p. 24.

2 Ibid., p. 26.

3 Donald Gerwin, Budgeting Public Funds: The Decision Process in an Urban School District, Madison: The University of Wisconsin Press, 1969.

had a lower starting salary for teachers with a bachelor's degree. A comparable district was defined to be one with enrollment of at least 50,000, a city as opposed to a county system, and in the same section of the country.

The implication of this finding, that interorganizational comparisons exert a profound influence in the decision making process for teachers' salaries, has been noted by other writers. Benson has observed that comparative figures from other school systems (as well as other occupations) are useful in determining minimum salaries,[4] and James, Kelly and Garms in studying a number of large urban districts were told of salary decision rules based on comparisons.[5] It therefore appears that a model of the salary decision process could be developed by isolating a cluster of school districts and observing the effects that the decisions of each one have on all the others. In such a model the salaries of the selected districts would be considered as endogenous variables while information from the environment would be treated exogenously. This conceptualization of the problem is tantamount to the rigorous study of an "orbit of coercive comparison"[6] or a "wage contour"[7]; a familiar concept in the Industrial Relations literature.

The cluster of school districts which was studied was chosen by first considering all eighteen of those in Milwaukee County. Preliminary interviews, as well as the author's above mentioned research, suggested that the city of Milwaukee is more likely to be concerned with other large urban districts rather than its suburbs, and therefore its salary decisions could be considered as exogenous with respect to the other seventeen. The preliminary interviews also suggested that there were two or perhaps three fairly well defined clusters among the remaining seventeen. It would be unwarranted to claim that these orbits are completely independent. Rather, districts in a given orbit tend to be more influenced by each other than systems not in it.

My intention in this study is to concentrate on a "north side" group of seven districts, excluding one which has a relatively tenuous link to the others. There also seems to be a "south side" group of eight districts. A possible reason for the existence of separate clusters is that they are geographically separated from each other,

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4 Charles S. Benson, The Economics of Public Education, Boston: Houghton Mifflin, 1961, p. 407.

5 H. Thomas James, et. al., Determinants of Educational Expenditures in Large Cities of the United States, Stanford University, School of Education, 1966, p. 64.

6 Arthur M. Ross, Trade Union Wage Policy, Berkeley: University of California Press, 1948.

7 John T. Dunlop, "The Task of Contemporary Wage Theory" in George W. Taylor and Frank C. Pierson (eds.), New Concepts in Wage Determination, New York: McGraw-Hill, 1957, pp. 117-139.

mostly by the city of Milwaukee. Second, there is a tendency for the two to rank differently on various deomgraphic dimensions. For example, an estimated 64% of the north side's households have incomes of $10,000 or more, while the comparable statistic for the south side is 53%, or 44% upon elimination of two of the smallest municipalities.[8] Once more, in the north side about 52% of the total land use is devoted to residences, while the comparable south side figure is only 19%.[9]

There is also a possibility of a third cluster consisting of two contiguous districts with much larger enrollments than the other suburban systems. However, since it was only important to determine the contents of the north side cluster, a great deal of time was not devoted to identifying other groupings.

Table 1 provides information on the characteristics of the north side school districts and municipalities. Milwaukee is included because it is part of the model and for the purpose of comparison. Fox Point-Bayside, Glendale-River Hills, and Mapledale-Indian Hills are elementary systems providing education from kindergarten through the eighth grade. Nicolet is the high school serving the same area as these three. Whitefish Bay and Shorewood provide education from kindergarten through the twelfth grade. The figures on enrollment and number of teachers, when compared with those of Milwaukee, indicate we are dealing with very small districts. The per pupil costs are all on the high side as compared to the city; in fact, Fox Point-Bayside has the highest in the state. Under Wisconsin law teachers may bargain collectively with school boards for wages, hours, and conditions of employment. The column headed "Coll. Barg." indicates the school year subject to the first negotiated contract. Clearly, bargaining where it exists is a recent phenomenon, and accordingly not a factor during most of the years with which we shall be concerned. In addition, there was no indication of strikes, sanctions, mediation or factfinding in any of the suburbs. In all cases, including Milwaukee, the bargaining agent is affiliated with the National Education Association.

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8 Data compiled from The Milwaukee Journal Consumer Analysis, Milwaukee: The Journal, 1969, p. 6.

9 Data compiled from 1967 Land Use Inventory Update, Waukesha, Wis.: Southeastern Wisconsin Regional Planning Commission, 1969.

TABLE 1. CHARACTERISTICS OF NORTH SIDE SCHOOL DISTRICTS AND MUNICIPALITIES

	DISTRICT					MUNICIPALITY			
	GRADES[3]	ENROLLMENT[3]	NUMBER OF TEACHERS[3]	COST/ADM[4]	COLL. BARG.[5]	POP.[6]	INCOME[6]	RES. LAND USE[8]	COMM., IND. LAND USE[8]
FOX POINT-BAYSIDE[1]	K-8	1,528	95	$1,401	1968-69	12,470	NA[7]	66%	1%
GLENDALE-RIVER HILLS[1]	K-8	2,075	113	1,081	1968-69	12,580	NA[7]	33	8
MAPLEDALE-INDIAN HILLS[1]	K-8	870	47	1,128	-	1,500	NA[7]	54	0
NICOLET[2]	9-12	2,105	113	1,343	1968-69	26,550	76%	50	3
SHOREWOOD	K-12	2,828	136	1,015	1965-66	16,730	51	54	3
WHITEFISH BAY	K-12	4,181	216	1,076	-	18,750	61	63	1
MILWAUKEE	K-12	130,534	4,906	941	1965	786,700	27	29	6

1
These districts are for the most part, but not exactly coterminous with the Fox Point, Bayside; Glendale; and River Hills municipalities respectively.

2
Coterminous with the four above mentioned municipalities.

3
Cooperative Educational Service Agency 19, Service Guide, 1968-69, Milwaukee: The Agency, 1969.

4
Citizen's Governmental Research Bureau, Milwaukee: The Bureau, Vol. 57, No. 6, May 17, 1969, p. 8.

5
This information was obtained from each of the school districts.

6
The Milwaukee Journal Consumer Analysis, op. cit., pp. 6,7. The numbers in the Income column represent the percent of households with incomes $\geq$ $10,000.

7
Not available.

8
1967 Land Use Inventory Update, op. cit.

Now let us turn to the characteristics of the areas served by the six school systems.[10] The population provides further confirmation that we are dealing with small units. The income figures, which represent the fraction of households with incomes greater than or equal to $10,000, clearly show that these are relatively wealthy communities. The land use data indicate that with the exception of Glendale we are dealing with communities which have attempted to concentrate on residential development. In short, we are concerned with small, wealthy suburban areas which are willing to support high cost education (including the highest teachers' salaries in the state) and have had, relatively speaking, cordial relations with their teachers.

Not indicated in the table are the facts that since Glendale is a city district and Milwaukee is a first class district, they operate with a calendar year budget which must be submitted to their respective city councils for approval. While Milwaukee considers salary increases in the fall for the coming calendar year, Glendale makes its decisions from roughly December to March for the coming school year. The remaining districts are in villages and therefore have fiscal year budgets which must be approved at annual meetings of the citizens. Their compensation decisions are made at the same time of the year as Glendale and are also for the coming school year. In all cases board members are elected.

In order to study salary increases it is first necessary to explain the methods by which teachers are paid. This is not easy because the six teachers' salary schedules are complicated, different from each other in a number of respects, and have undergone significant changes over the time period studied. For all practical purposes the districts can be considered to currently have single salary schedules; matrices whose columns represent academic background (e.g. bachelor's degree, master's degree, master's degree + 15 credits), and whose rows (steps) represent number of years of teaching experience up to some maximum. The number of rows and columns, and the magnitudes of salaries in the schedules vary from one district to another. Over the years a number of different methods have been used to construct schedules. The two most popular have been the index system in which all salaries are expressed as multiples of some base salary, and the "fixed increment" system in which the differences between adjacent steps in the same column (increments) are chosen according to some rationale and then held constant.

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10 The first three districts are each for the most part, but not exactly, coterminous with a municipal boundary. The figures used are those for the municipality which forms the greatest part of a district's area. Since the purpose of the data is just to provide a general indication of characteristics, fairly large errors, as is apparently the case when Mapledale's enrollment and population are compared, can be tolerated.

Each year virtually all teachers in a given district advance to the next row in their schedule and thereby receive their increments. An across the board salary increase, which is given annually, occurs when all the salaries in the matrix are increased, but not necessarily in the same amount. The formula used may involve equal amounts, equal percentages, or percentages or amounts which depend upon experience or academic degree. In addition, salary increases may occur as the philosophy behind the schedule is revised in the light of changing conditions. Thus, the number of rows or columns or the salary progressions in part or in all of the schedule may be affected. Miscellaneous factors such as dependency allotments and merit raises built on top of the schedule, and putting teachers "on schedule" also account for increases.

It seemed prohibitive to try to understand the manner in which all these different types of increases come about. Further, it was not even possible to develop for each district a history of when they occurred and the amount of funds involved. Instead it was decided to concentrate on increases in one important element of the schedule, the B.A. Minimum (Bamin) salary, the starting salary for teachers with a bachelor's degree. Administrators find it important because of its role in hiring new college graduates.[11] It is important to teachers because if they can get it raised all other salaries are also likely to be increased due to equity considerations. Moreover, as documented in Appendix 1, the districts studied have in many instances granted across the board increases related to the increase in the B.A. Minimum. Hence, to a large extent, understanding the decision process for this one salary leads to an understanding of across the board raises.

The Bamin salaries of the six north side districts and Milwaukee, shown in Appendix 2, were collected for the 1959/60 through 1968/69 school years.[12] Data was not collected prior to 1959/60 because the existence of several districts in the north side area which were subsequently annexed would complicate the model, because it was felt meaningful insights into decision making so far in the past could not currently be gained, and because some of the information was unavailable.

Figure 1 provides some information on Bamin salaries in the north side systems over the time period investigated. The graph in the upper left indicates the highest, the average, and the lowest Bamin in each

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11 However, the Bamin is not as crucial for recruiting purposes in the type of districts studied as in say a large urban one because a relatively small percentage of new faculty in any given year are just out of college.

12 I am indebted to Miss Evelyn Schuh of the Milwaukee Suburban Council of Education Associations for making this information available to me.

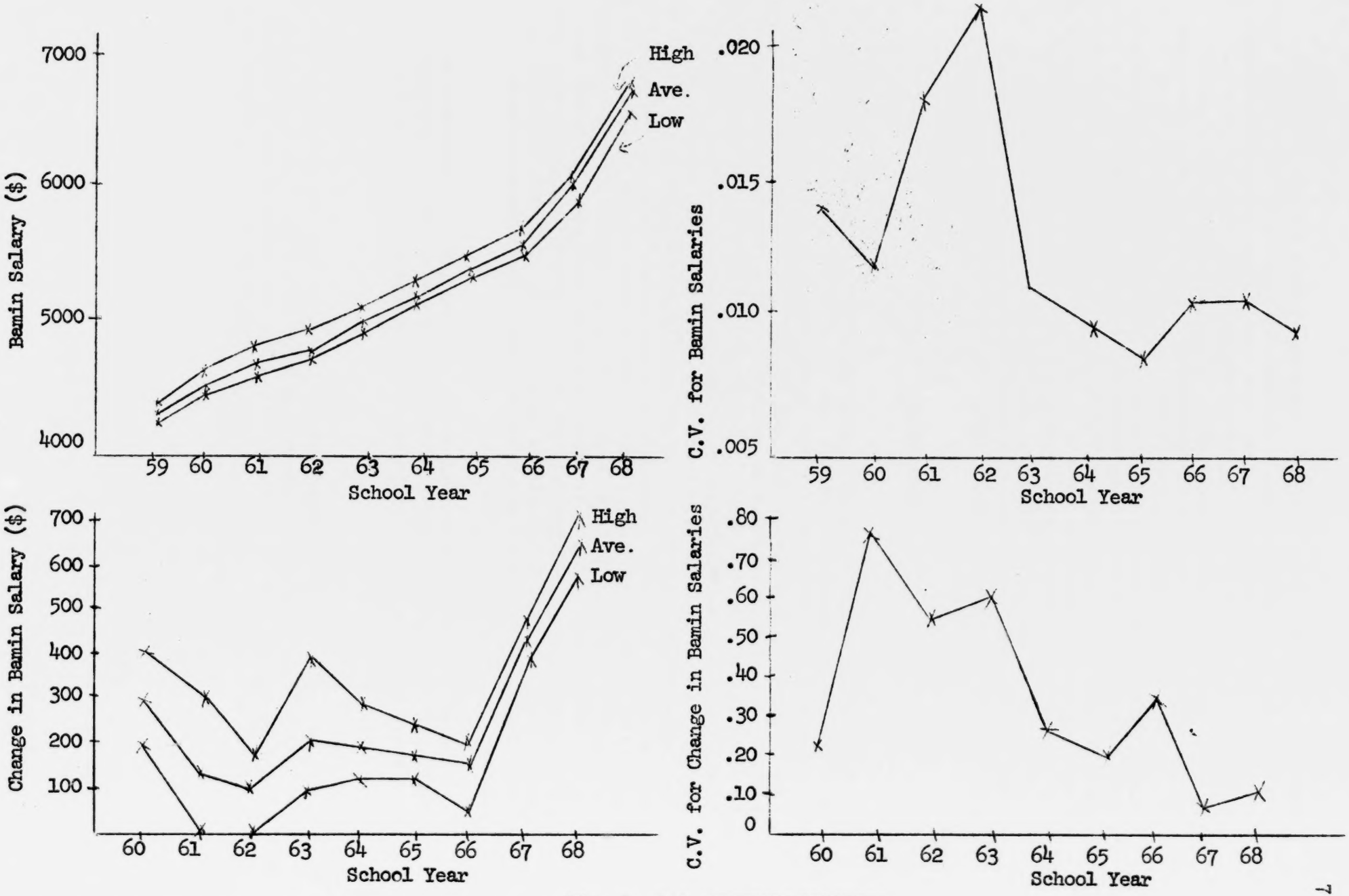

Fig. 1 B.A. MINIMUM SALARIES

year from 1959/60 through 1968/69. Salaries appear to follow a curvilinear path up to 1963/64, then a straight line up to 1966/67, after which they move up sharply. Clearly, the Bamin range, when compared to the magnitude of the average salary is quite small. This is also indicated by the plot of the coefficient of variation of salaries (C.V.) in the upper right. A graph of the highest, the average, and the lowest change in the Bamin provides a curve which decreases in value, then roughly holds even, and finally increases, reflecting the salary pattern mentioned above. As would be expected the first difference variable exhibits more variation, but this is to a surprisingly large degree. For example, in 1963/64 the largest increase was four times the value of the smallest. This general finding is confirmed by the plot of the coefficient of variation which for example almost reaches 0.80 in 1961/62. However, it appears that there has been a trend since that year towards smaller differences among changes in salary.

Methodology

The study of the teachers' salary decision will be looked upon as an information processing problem. Let us consider a school district as the basic unit of analysis. The input to each unit consists of various types of data from within and outside the cluster, while a specific decision is regarded as the output. The conversion of inputs to outputs, that is each system's policy with regard to the B.A. Minimum, is represented by a rudimentary discrimination net. Basically, the net consists of test nodes, operations nodes, terminal nodes and the pathways between them. At the test nodes questions are asked concerning the content of the data. Depending upon the answer to a question we are led down one of two paths, each of which leads either to another test node, an operations node where the data are worked upon, or ultimately to a terminal node at which is stored a salary decision. Thus, the net sorts or processes the input data in order to arrive at a particular outcome. This approach is associated with the work of Newell and Simon on individual problem solving and Cyert and March in an organizational context.[13]

Using such a method to analyze the problem makes it necessary to initially focus on the types of information gathered by each district, and their salary policies. This in turn requires a methodology for

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13 Allen Newell and H. A. Simon, "GPS, A Program That Simulates Human Thought", in Edward A. Feigenbaum and Julian Feldman (eds.) Computers and Thought, New York: McGraw-Hill, 1963, pp. 279-293, and Richard M. Cyert and James G. March, A Behavioral Theory of the Firm, Englewood Cliffs, N.J.: Prentice-Hall, 1963.

gathering and organizing data which at present is almost nonexistent for decisions of the type studied here. A second major purpose of my study is to present some tools which can be utilized for these purposes.

The protocol is the chief tool for gathering data when constructing information processing models of human problem solving in a laboratory setting. Basically, it is a record of the subject's thinking as he solves a problem, which is obtained by asking him to state what is going on in his mind. Protocols have been used by Newell and Simon in the development of their General Problem Solver,[14] and by Feldman in his study of decision making in the binary choice experiment.[15] In addition, the technique has been employed in at least one field study; that of Clarkson who examined the manner in which a trust investment officer selected stocks for his clients' portfolios.[16]

But the decision to be analyzed here differs in some important respects from the types analyzed by Newell, Simon, Feldman and Clarkson (although it does not differ from all four in each of these respects). For example, it is made by groups of individuals including school board members, superintendents and representatives of teachers' associations, rather than by a single person. It is the outcome of a process that may take anywhere from one to five months as opposed to a single sitting. Although the decision is repetitive it is made only once a year, and since the participants in the process are changing there are currently few individuals who have participated in it more than a few times.

In view of the large number of people involved, the length of the process, and the relative inexperience of most of the participants, it did not seem feasible to utilize protocols to gather data. It is little wonder that previous attempts to apply an information processing framework to similar types of decisions have depended primarily upon unstructured interviews and the analysis of written documents.[17] These methods, while

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14 Allen Newell and H. A. Simon, "GPS, A Program That Simulates Human Thought", in Feigenbaum and Feldman, op. cit., pp. 279-293.

15 Julian Feldman, "Simulation of Behavior in the Binary Choice Experiment", in Feigenbaum and Feldman, op. cit., pp. 329-346.

16 Geoffrey P. E. Clarkson, "A Model of the Trust Investment Process", in Feigenbaum and Feldman, op. cit., pp. 347-371.

17 John P. Crecine, Governmental Problem-Solving: A Computer Simulation of Municipal Budgeting, Chicago: Rand McNally, 1969, C. Edward Weber, "Intraorganizational Decision Processes Influencing the EDP Staff Budget", Management Science, Vol. 12, No. 4, December, 1965, and Donald Gerwin, op. cit. are examples.

not without merit, are subject to some serious objections. Respondents, for a variety of reasons, find it difficult to accurately remember what they did in the past (retrospective bias), while written accounts, since prepared for other purposes, rarely provide material on what is of direct concern to the investigator.

In order to overcome these objections a completely different procedure was used to gather data. Essentially, it involves obtaining protocols from respondents while they are making decisions in a simulated situation. While it will become clear that there are also difficulties with the new method, it appears to be at least a step in the direction of more insightful responses.

In a preliminary set of unstructured interviews (one with each of the six superintendents) an overall view of the decision process was obtained with special emphasis on learning about the participants, the steps in the process, and the sources and content of information. Then, in depth sessions were held with each superintendent, and various board and ex-board members. The number of respondents is given in Appendix 1. Individuals in the last two groups were selected on the basis of length of service and their involvement in determining teachers' salary increases. Teachers were not included so concentration could be placed on the large number of individuals who had most to do with the decision over the time period studied.

Prior to the in depth session each respondent was asked to identify the information he felt was most crucial in deciding upon the Bamin salary. It was then gathered for each year since 1960/61 that he was with the particular district. When the session began the respondent was presented with the situation facing the district in the first of these years as represented by the information he had requested. He was then asked to use the data to determine his district's decision in that year, and to think aloud while he was engaged in this process. After the respondent arrived at his answer, any discrepancy between it and the actual magnitude was discussed. The procedure was then repeated for the other years he was with the district and the information utilized for his previous choices left available to him. A tape recording of the entire proceedings was made.

After the first few sessions it became obvious that the most pertinent information would be the Bamin salaries of the north side systems and Milwaukee. It was therefore prepared in a special format. Table 2 provides an example utilizing Fox Point and the Bamin decision for the 1960/61 school year. The bottom set of figures presents the current (1959/60) Bamin salaries of the seven districts. The top set indicates the 1960/61 salary for Milwaukee; the only system that made its decision before Fox Point in that year. At least this much salary data would have been available to the suburban system. The data sheets also indicate the years in which any basic changes occurred, either in the salary schedule such as adopting an index plan, or in the decision process such

as the beginning of collective bargaining. Otherwise, the respondents were likely to think these events occurred in the wrong years.

TABLE 2. SAMPLE DATA SHEET

1960/61

MILW	4550
FX PT	
GLDLE	
SHRWD	
MPDLE	
NCOLT	
WF BY	

1959/60

MILW	4200
FX PT	4200
GLDLE	4325
MPDLE	4300
NCOLT	4200
SHRWD	4300
WF BY	4200

Other types of information that were made available included school board composition, cost of living (national and Milwaukee), number of teachers hired, decisions on other parts of the compensation package, and relevant passages from school board minutes. If a particular type of requested information could not be compiled the respondent where possible was asked to make a choice first assuming a high value and then a low value.

Overview of the Decision Process

The first step in understanding the Bamin decision in our cluster will be to indicate the steps in the decision process. The preliminary interviews with the six superintendents suggested that the steps were roughly similar in all of them. Consequently, it was decided to prepare a single flowchart which would depict the basic similarities in the current situation and then to mention any differences. In addition to current differences among districts, changes over time must also be discussed.

Figure 2 shows the typical situation in the 1968/69 school year; that is, when the 1969/70 decisions were being made. Here, the relatively

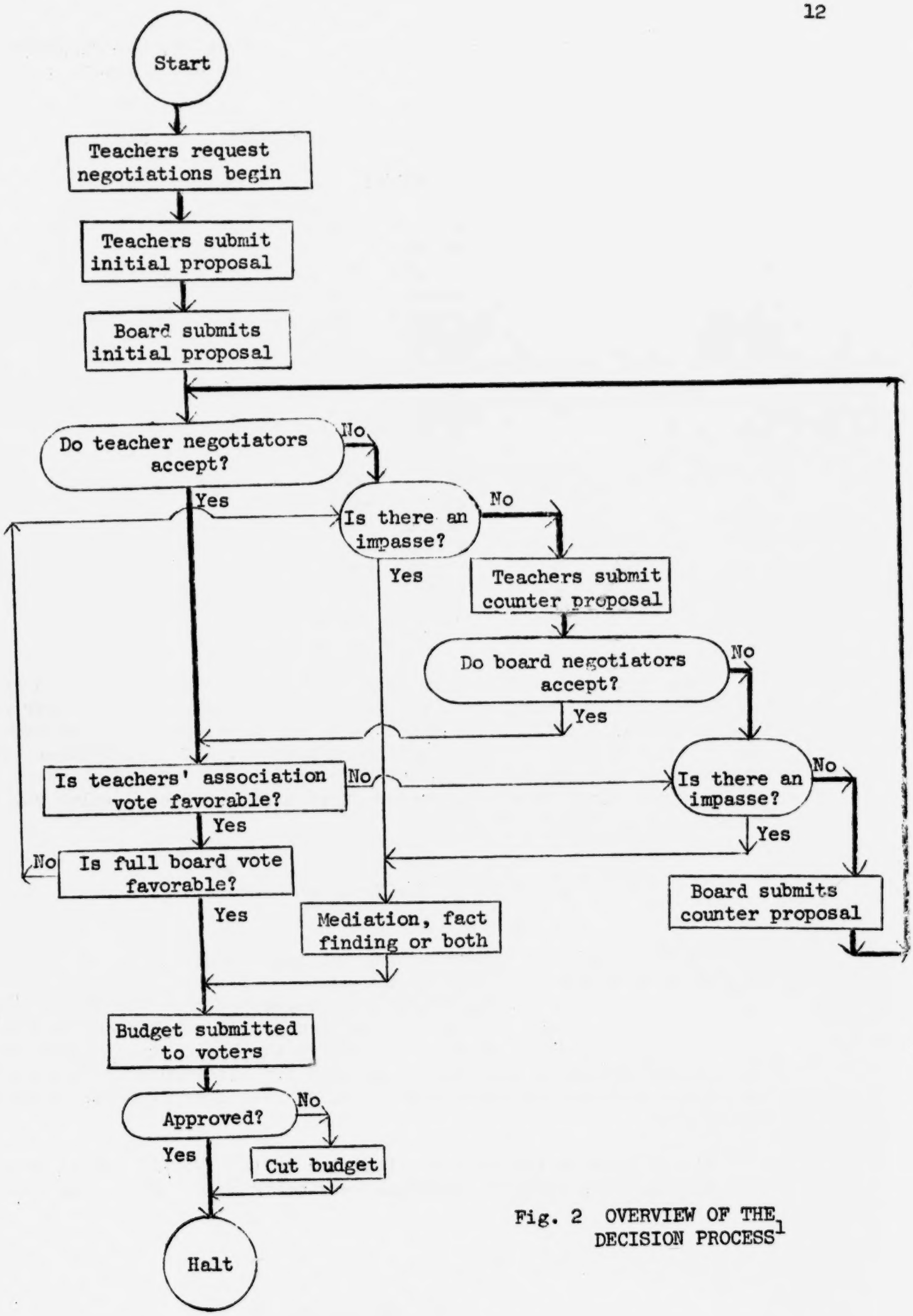

Fig. 2 OVERVIEW OF THE DECISION PROCESS[1]

1 ——— lines = most heavily used paths

heavy lines show the most frequently used path. The process is initiated with a request, usually around the beginning of December, by the salary and welfare committee of the local education association that negotiations begin. Representatives selected from the school board and the teachers' committee take part in the sessions. After both sides present their initial proposals a few rounds of counterproposals will usually follow. The full board will typically participate in the development of proposals, while the main burden on the teachers' side will fall on the salary committee. During this process the committee may bring its ideas and those of the other side to the entire faculty for a vote at any time.

If agreement between the two sides cannot be reached, state law provides for mediation, fact finding, or both. This path has not yet been taken by any of the districts studied.

When the negotiators reach agreement the results are presented to the full membership of the school board and teachers' association for approval. It is unlikely that there would be a negative vote at this point. In general the negotiations are concluded by March 15 for this is the date by which contracts should be received by teachers. However, it is becoming less rare for sessions to extend into April.

Finally, the budget must be approved by the district's voters in an annual meeting held in July. To the best of my knowledge approval has always been forthcoming. At any rate, it does not seem likely that a cut in the budget would affect teachers' salaries since virtually all contracts will have been signed by this time.

Now let us look at the current differences from the flowchart. Glendale being a city as opposed to a village district prepares its budget in the fall and then it is adopted by the city council after a public hearing before the end of the calendar year. However, as with the other systems, negotiations are for the next school year and are held roughly from December to March. Mapledale did not have a formal collective bargaining agreement with its teachers as of the negotiations for the 1968/69 school year. However, the interviews revealed that its process was essentially the same as the others' for it was involved in an informal bargaining arrangement. In Shorewood the teachers iron out minor problems with the superintendent before they meet with the board. Whitefish Bay has a budget hearing before the annual meeting. It also has the same type of informal bargaining arrangement as Mapledale.

The essential temporal difference seems to be that up until about 1966/67, after the teachers would make a request the school board would generally make its decision. There was little formal or informal bargaining as exemplified by counterproposals. Once more, the superintendent played more of a role in developing teachers' proposals.

Finally, it should be pointed out that due to the recent installation of collective bargaining the structure of the decision process is currently rather flexible. The immediate future may see important changes

particularly with respect to a greater degree of cooperation among school boards and also among teachers' associations.

Sources and Content of Information

The approach taken in this paper considers that inputs to the decision process are in the form of information. Information here has two major components; data needed to make reasoned judgments such as the salaries of other districts, and opinions as exemplified by citizens' complaints about higher taxes. The ensuing analysis of the sources and content of these two components, developed from the interviews, concentrates on the current situation in a hypothetical unit.[18] It was not possible to inquire whether each district received all the data and from the same sources that are associated with this unit. Rather the analysis represents my general impressions as to which features are essential and common to most of the systems. Unless otherwise specified it should be assumed that communications are sent and received during winter and spring while negotiations are being conducted.

A pictorial representation of the information flow is presented in Figure 3. The chart was constructed using two basic dimensions. The first classifies the sources according to geographical area. Its five categories, bounded by the inner circle and the three outer ovals, include the negotiations site, the school district, the north side, the metropolitan area, and the rest of the environment. The second dimension classifies sources according to who receives their outputs. The left quadrant is for the school board's, while that on the right is for the teachers'. The upper and lower quadrants are for sources which are utilized by both sides, while the inner circle involves communications sent to each other. In the latter case the board's negotiators are of course the recipients of proposals from the other side concerning salaries, benefits and working conditions (P).[19] They are also informed about settlements in neighboring areas (S) especially those favorable to teachers, and are provided with the results of votes taken by the local association on their proposals (V). The teachers' negotiators likewise receive proposals (P) and are informed about settlements considered favorable to the other side (S).

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18 I first became acquainted with this technique in an Organizations course taught by James March.

19 The superintendent, business manager or both may attend the sessions to answer questions of fact for both sides. However, their more important function is to advise the school board in the preparation of proposals. To avoid confusion Figure 3 shows them only in their latter role.

Now let us discuss the information sent more or less exclusively to the board's negotiators. One important set of sources for this purpose is the members of various school boards. For example, the rest of the board in a particular district receives basically the same information as its bargaining representatives.[20] Accordingly, they develop their own opinions concerning teachers' salaries (O) which are transmitted as influence attempts. In addition, board members in the other north side districts will supply on request, information on the current state of their own negotiations (CS) including the latest proposals of each side, cost implications, and expectations as to what will happen in the future.[21] This flow is facilitated by an informal communications network partially determined by personal friendships and involving phone calls and even chance face to face meetings.

The local school boards' association embraces an area which includes Milwaukee County and its northern neighbor, Ozaukee County. Meetings of the association's negotiations committee are primarily designed to share information about the current state (CS). The committee also prepares a report indicating the present salary structure of its members (PS), and individuals undoubtedly express their opinions as to the appropriate levels for the coming year's salaries (O).

The Wisconsin Association of School Boards (WASB) advises districts throughout the state about any recent settlements by means of a newsletter (S). It also conducts an annual survey which indicates the present salary structure of all the districts in the state (PS), and provides regional telephone hookups so that board members in wide areas of the state may discuss matters of special interest such as teachers' salaries.

Superintendents represent another useful set of sources for a board's negotiators. The chief administrative officer of each system is usually called upon to make recommendations on the salary structure (O) which are based on a number of considerations also communicated to the board. During the school year he has developed, through his daily contacts with teachers, an impression of their opinions concerning salaries (O). He is also familiar with the previous Spring's recruiting results (R) and relays data such as the number of applicants for each position and the number of desired applicants who went elsewhere. In addition, he may have a rough estimate of the number of teachers needed for the coming year (R), but it is usually too early at this time to calculate an accurate figure. Through his contacts with other northside superintendents (phone calls, meetings) he relays information about the current state of their negotiations (CS).

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20 Not indicated in Figure 3 to avoid confusion.

21 The current state should also be considered to include settlements which have just been arranged. When settlement information (S) is indicated on the chart it means the source does not tend to also supply data on the current situation in uncompleted negotiations.

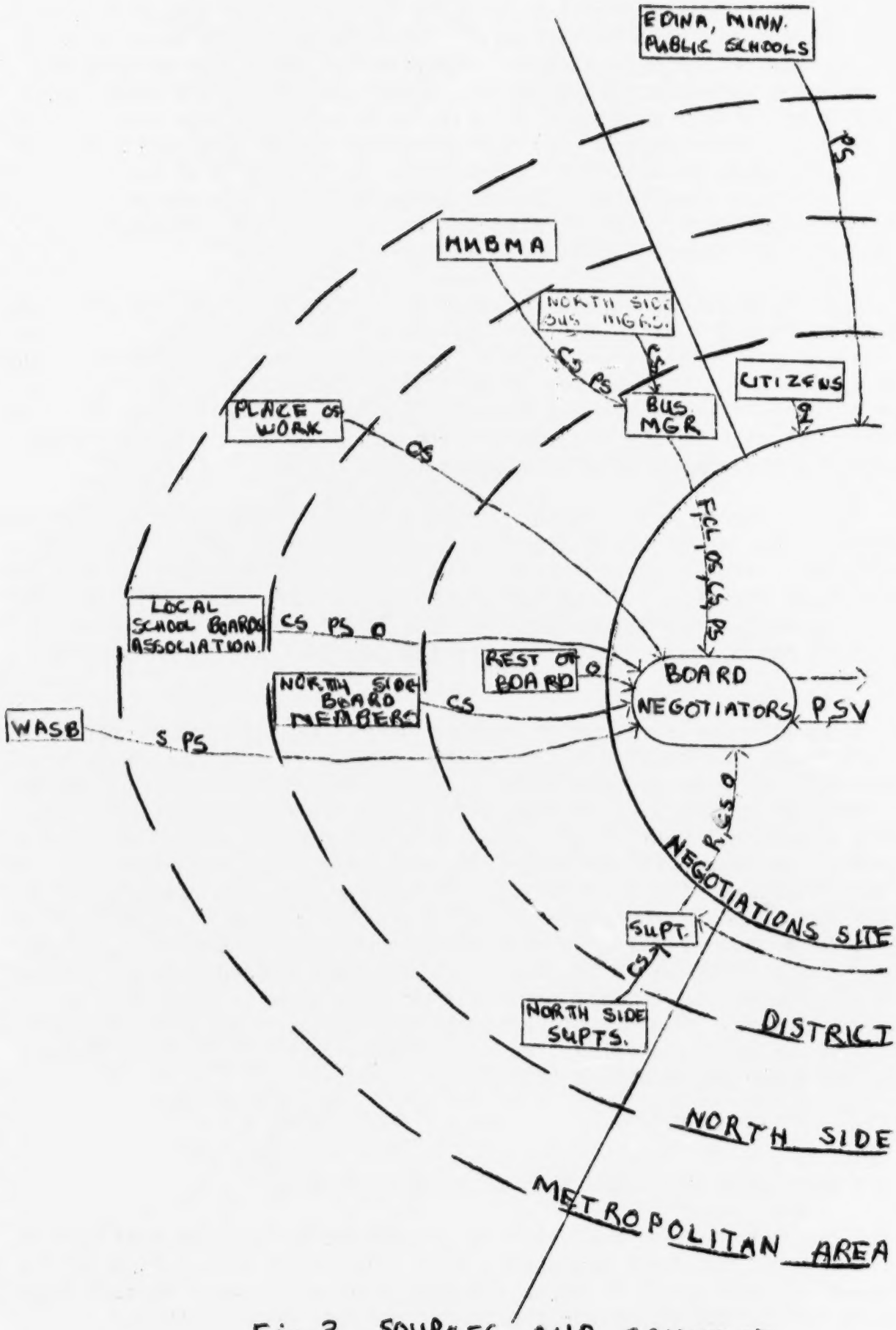
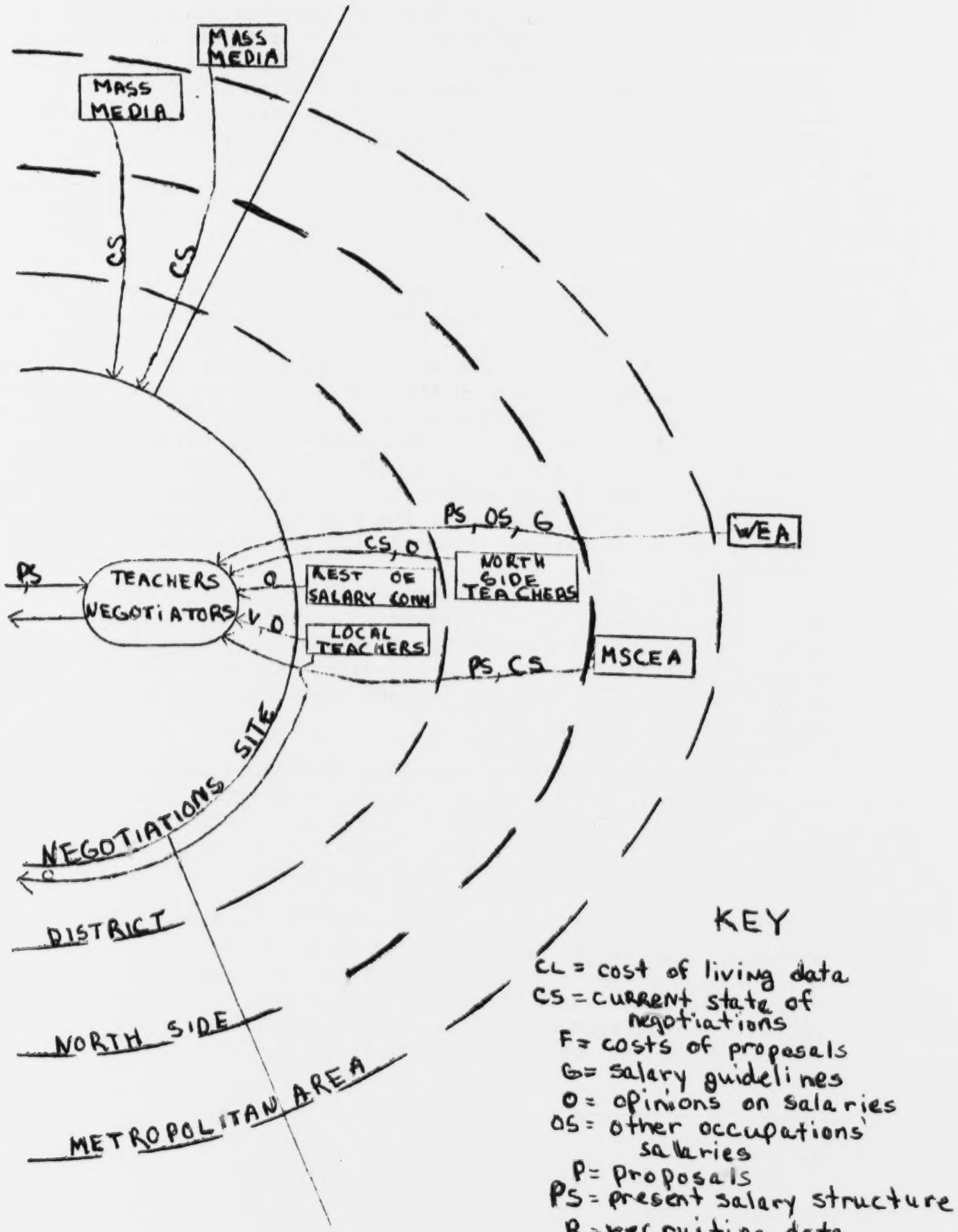


Fig 3 SOURCES AND CONTENT OF INFORMATION



KEY

CL = cost of living data
CS = current state of negotiations
F = costs of proposals
G = salary guidelines
O = opinions on salaries
OS = other occupations' salaries
P = proposals
PS = present salary structure
R = recruiting data
S = settlements
V = votes

A third major path useful to the school board involves business managers. A district's business manager supplies the financial implications of both sides' proposals (F). He may also gather a wide range of miscellaneous data such as the cost of living (CL) and salaries of other professionals in the metropolitan area (OS). Through his informal contacts with other north side business managers, his possible attendance at the meetings of the negotiations committee of the school boards' association and his appearances at the monthly meetings of the Metropolitan Milwaukee Business Managers Association (MMBMA) he is an important relayer of information on the current state of negotiations (CS) and present salary structures (PS) elsewhere.

Finally, the school board negotiators are sensitive to the salaries being offered at their own places of work to individuals judged as being roughly comparable to teachers (OS).

Now let us examine the information sent more or less exclusively to the teachers' representatives at the bargaining table. In addition to the school board's proposals the predominant set of sources involves various teachers' groups. The rest of the members of the salary and welfare committee receive much the same communications as the negotiators[22] from which they develop their own opinions (O). The membership of the local education association is usually polled before negotiations commence to discover its opinions about salaries (O). It has been previously mentioned that individual teacher's desires are made known to the superintendent throughout the year (O). During the negotiations teachers' votes on various proposals (V) are obtained.

The occasional informal meetings of the north side teachers' negotiators are designed to share information on the current state in each of their systems (CS). Undoubtedly, individuals at these meetings also express their opinions concerning desired salary levels (O). There are probably other means of contact among the north side representatives such as phone calls.

The Milwaukee Suburban Council of Education Associations (MSCEA) is comprised of most of the educational associations in the metropolitan area. This organization prepares an annual salary survey which indicates present salary structures (PS). It also serves as a location for discussions of the current state of negotiations in each district (CS).

The Wisconsin Education Association (WEA), through its seminars and published reports provides a wide variety of data including the present compensation policies of all districts in the state (PS) and comparisons to the salaries of other occupations (OS). It also establishes guidelines (G), such as the M.A. Maximum should be twice the B.A. Minimum after ten years, which work their way into proposals in one form or another.

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22 Not shown to avoid confusion.

There also exist certain types of information that are readily available to both teachers and school boards. For example, citizens, by expressing their opinions about taxes at the regular and annual board meetings, communicate information to both sides (O). The school board also learns about community attitudes at election time when incumbents campaigning for reelection relay information back to the other members. Election results (V), although often difficult to interpret unambiguously, may also provide significant cues.

Local mass media provide the details of the Milwaukee salary settlement (S) which has always occurred around the start of the suburbs' negotiations because it is for the calendar year. Both local and national media act as sources for the current state of negotiations (CS) and settlements (S) in large cities and suburbs across the nation. Finally, data on the present salaries of suburbs on a nationwide basis is available through a report published by the Edina, Minnesota public schools (PS).

Which types and sources of data are the most influential in decision making? The Milwaukee settlement, obtained from local mass media, fits into this category. In addition both sides rely heavily upon the settlements and current state of negotiations in the other north side systems. The teachers' main source of these data is their informal contacts, while the school board depends upon its informal contacts and the negotiations committee of the school boards association. Certainly, each side's proposals, which are in part based on the above data, are a final important factor.

Outline of the Model

It is now possible to begin the rigorous analysis promised earlier. This section presents an outline of a computer simulation model of the Bamin salary decision. It consists of six rudimentary discrimination nets and a seventh one common to all. The main input to each net, in other words the information revealed by the previous analysis to be most influential, is the Bamins which have already been decided upon for the coming year.

Some nets also use the initial Bamin request of the local teachers' association.[23] However, the incorporation of this factor into the model was hampered by the difficulty in gathering an adequate history of requests, and the fact that the data were not available until most of the

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23 It is not known whether due to bargaining subsequent requests may have been made in a particular year. However, this does not appear to be a significant consideration until the recent past.

decision simulation interviews had been held. Teachers' requests, obtained from a variety of sources, are presented in Appendix 2.

The model also must be provided with the sequence of settlements in any year; a factor much too complicated to be predicted. For this purpose it is assumed that a district's Bamin becomes available to the others immediately after the decision is made. Therefore, the settlement date, operationally defined as when the school board votes its approval, is used to indicate when the information is communicated. These dates, collected from school board minutes, are tabulated in Appendix 2. A cursory analysis reveals some tendency in most years to bunch up around the March 15th deadline for sending contracts to teachers (although it is apparently not enforced). It also indicates that recently the process has been lengthening.

The overall structure of the model is depicted in Figure 4. Milwaukee is always the first system to make a decision since it is made for a calendar year as opposed to the school year beginning nine months later. Its Bamin, considered exogenous in the model, is therefore always available to the second district (first suburb) to settle. After the second has come to its decision there are two Bamins available to the third and so on. Finally, the last system to settle has available the Bamins of all the preceding ones in making its choice.

The sequential nature of the decision process implies that three different versions of the model can be formulated. Model 1 is in reality a collection of six unrelated ones. A given district's Bamin is predicted using the actual values of all input information. Predictions can be made one year ahead for any suburb but only after the decisions of those neighbors which settled before it are known or predicted exogenously.

Model 2, a one period change model, predicts a suburb's Bamin by using its own predictions of the Bamins of those suburbs which settled before it for the coming year. All other input information is considered exogenous. It can make predictions one year ahead for all the suburbs provided forecasts of the exogenous factors such as the settlement order are made.

Model 3, a dynamic model, predict's a Bamin using its own predictions of both the Bamins already decided upon for the coming year and those in effect in the present year. It predicts as many years ahead as desired for all the suburbs provided the exogenous factors are also forecasted. However, since the present year's Bamins played a role in the discrimination net of only one system this model closely resembles Model 2. Accordingly, no further mention of Model 3 will be made.

The Model

The decision process can be seen as having two stages. In the first the school board attempts to structure the situation by determining a

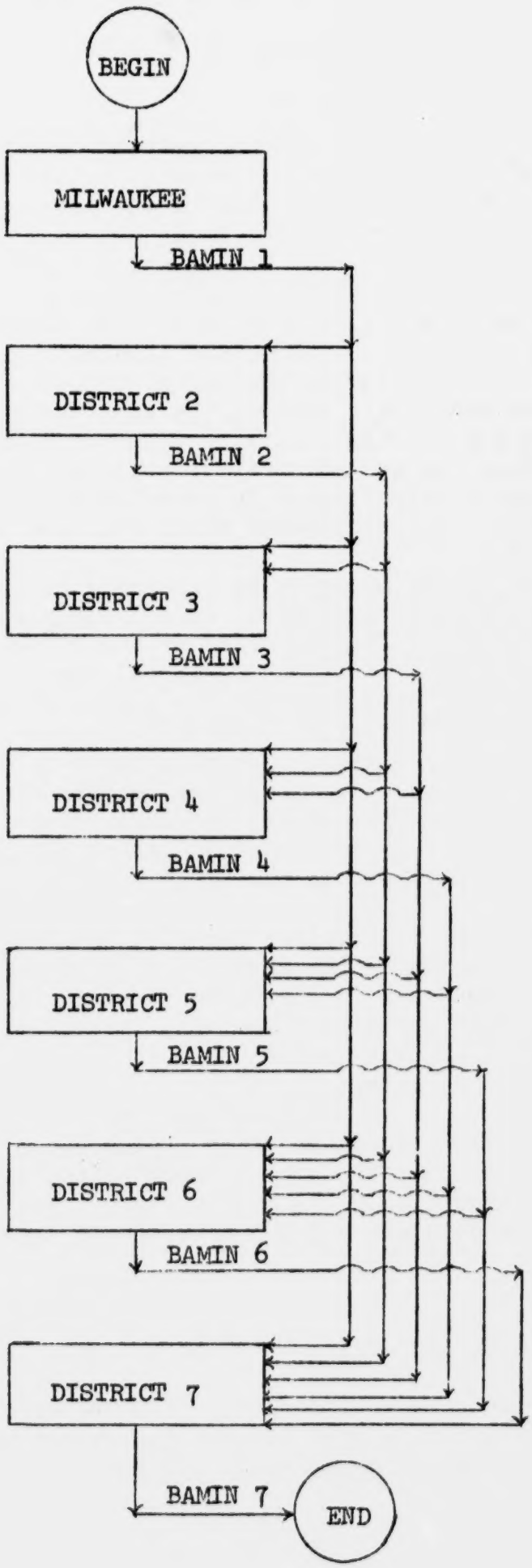

Fig. 4 OUTLINE OF THE MODEL

range within which the Bamin choice can be made. Second, a particular value is chosen from the range.

Determining the Range

According to Feigenbaum and Feldman pattern recognition activity involves the reduction of complex environments to aid in problem solving.[24] It is therefore not surprising that some of the people interviewed mentioned they looked for patterns in the Bamin salaries of those systems that settled previously to theirs. For example, there was a suggestion that decision makers are influenced by modes when they exist. More important, school board members try to develop a range within which the Bamin decision will be made. The most important information for this purpose is the highest and lowest salaries arrived at to date. If just a few other districts have made their choices, the range acts as a hazy guideline so that there may be differences between the values advocated by various board members. As more districts settle the range set by the previous ones becomes a firmer guide in decision making. In fact, as we shall see, it becomes a rigid boundary which will not be violated.

This phenomenon can be analyzed by referring to Table 3a. The data were compiled in the following manner. First, the highest and lowest Bamins of the systems which decided ahead of the k^{th} one (where k=3,4,5,6,7 represents the settlement position) were determined for each of the nine years of data.[25] Then the number of times over the entire period that the k^{th} district exceeded the upper limit or failed to reach the lower was calculated. Clearly, there is a tendency for the number of violations to decrease as the settlement position increases whether one considers the upper limit, the lower limit or both together. In particular, there was only one range violation out of a possible eighteen for districts settling in the sixth or seventh positions.

The balance of Table 3a provides for each settlement position the average amount of violation of the upper limit, the lower limit, and both of them. There is a tendency in all three cases for the averages to decrease as the settlement position increases. Moreover, violations of the upper limit are in general smaller than violations of the lower regardless of settlement position.

There exist at least two alternative explanations for these findings which should be considered. Violations early in the sequence must widen the range making it less likely, purely by chance, for violations to occur later on. Some evidence which counters this argument appears in

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24 Edward A. Feigenbaum and Julian Feldman, op. cit., p. 236.

25 The second district to make its choice is aware of only the Milwaukee decision which will not be very helpful in estimating the range. For this reason the situation when k=2 is not included in the above analysis.

TABLE 3a RANGE VIOLATIONS

SETTLEMENT POSITION	NUMBER OF HIGHER OCCURRENCES	NUMBER OF LOWER OCCURRENCES	TOTAL	AVE. HIGH VIOLATION	AVE. LOW VIOLATION	AVE. VIOLATION
3	4	2	6	$62.5	$100.0	$75.0
4	1	2	3	25.0	75.0	58.3
5	2	1	3	25.0	50.0	33.3
6	0	0	0	0.0	0.0	0.0
7	0	1	1	0.0	50.0	50.0
ALL POSITIONS	7	6	13	$46.4	$ 75.0	$59.6

TABLE 3b RANGE ADHERENCES FOR POSITIONS SIX AND SEVEN

RANGE	NUMBER OF ADHERENCES FOR POSITION 6	NUMBER OF ADHERENCES FOR POSITION 7
$100	2	1
125	1	1
150	2	2
175	0	0
200	2	2
225	0	0
250	2	2

TABLE 3c SETTLEMENT POSITIONS

DISTRICT	POSITIONS					
	2	3	4	5	6	7
FX PT	3	2	1	1	2	0
GLDLE	0	3	2	1	1	2
MPDLE	1	1	2	2	1	2
NCOLT	1	1	2	1	2	2
SHRWD	1	1	2	3	1	1
WF BY	3	1	0	1	2	2

Table 3b. Here, are tabulated the number of times the sixth or seventh districts adhered to the existing range as a function of the value of the range. There is no tendency for districts facing relatively large values (e.g., $250) to adhere more closely than those facing relatively small values (e.g., $100).

It might also be claimed that a suburb tends to settle in the same position each year. Then the observed findings would represent the policies of particular districts rather than a constraint to which they all must adhere. Evidence against this interpretation is presented in Table 3c which shows the number of times each system settled in all the possible positions. Clearly, each of them has made its Bamin decision in a large number of different positions.

Policy Breaks

Once some idea of the allowable range for the Bamin has been established it is necessary to use existing policy to select a particular point. It was not surprising to discover that Bamin policies changed over the years investigated. In simulation models of human problem solving such learning may take place as the result of the continual collapsing of existing segments and construction of new portions of the discrimination net. The model presented here contains a rudimentary form of this type of adaptation; the occasional substitution of a new portion of the net for an existing part. It represents the situation in which a district first considers a new policy while maintaining the old and then suddenly decides to introduce it.

In order to predict when these Bamin "policy breaks" occur one must have their operational definition as well as that of an explanatory variable. Then the extent to which the occurrences of each coincide can be determined. It was not possible to arrive at either type of definition. The interviews and salary data provided clues as to the years in which policy breaks occurred. The initiation of major, lasting changes in the type of salary schedule, such as converting from a fixed increment to an index method of payment, also played a role. There are five policy breaks in the model, one for each of five suburbs, and all of them are associated with major schedule changes. This suggests that an explanatory variable may have been found. However, in addition to there being no operational definition of major schedule changes they were used in the identification of policy breaks. Further research is therefore necessary to verify any relationship.

Neither can the model formulate a new policy by say modifying the old as is done in human problem solving simulations. The new strategy must be supplied as well as an instruction to initiate it in the appropriate year. However, the above discussion implies that its content may be influenced by the philosophy behind the new type of schedule.

Neither the old nor the new policy is a good predictor of the Bamin increase in the policy break year in any of the five districts. However, a common pattern emerged in four of the districts which led to a prediction for them in such a year. The actual Bamin increase was always less than either the old or new strategy would predict. In three of the systems

(a determination could not be made for the fourth) this caused all other salaries in the schedule to be lower than would be expected. Since the new type of schedule was always adopted at the request of the teachers' association, it appears that school boards may have gotten a temporary limiting of salary increases in return. It is also possible in some of these cases that teachers were put on the new schedule immediately rather than over an extended period of time. This action might have held salary increases down if it involved a good deal of expense.

Some empirical justification for the policy break concept, including the special prediction in the policy break year, appears in Appendix 1. There it is shown that had the model maintained the five districts' original policies errors would have been sizeably increased.

The details of each district's part of the model will now be presented. In general each discussion will focus on Bamin policies, the reasons for their existence, the discrimination net, and extraneous factors that may influence decision making. The last topic is covered by discussing Model 1 errors greater than 25%. The discrepancy between district j's actual increase in year t (A_{jt}) and its predicted increase (P_{jt}) is given by the percentage error:

$$\frac{100(A_{jt}-P_{jt})}{A_{jt}}.$$

There will also be a separate discussion of constraints common to all the systems.

Fox Point - Bayside

Fox Point exhibited two different Bamin strategies over the years investigated. The break occurred in 1967/68 when the salary schedule was changed. There was also a basic schedule change in 1960/61 but, since that is the first year with which the study is concerned, its association with a policy break could not be determined. A limiting of the salary increase occurred neither in 1960/61 nor 1967/68. In the former case the reason may be that the superintendent not the teachers had the original idea. In the latter case the explanation is not clear.[26]

From 1960/61 to 1966/67 separate "level of improvement" schedules existed for teachers with bachelor's and master's degrees. Row movements were determined by years of experience, but column movements by a merit evaluation. One of the purposes behind the schedules was to develop

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26 Changing to a new schedule was the teachers' idea and adopted many months before the details were worked out. At that earlier time the board may have received other types of concessions from the teachers.

a nucleus of experienced teachers by offering more steps than neighboring areas. There was an associated deemphasis on the lower and middle portions which in general led to Bamins on the low side.

Insight into the specific Bamin strategy was obtained from an analysis of the data. Each time Fox Point currently had the lowest Bamin in the north side, its new salary would be in line with its neighbors' new choices. Otherwise, its new salary would tend to fall short of their new selections. Curiously enough these two conditions occurred every other year. It appears that being at the bottom of the list stimulated teachers to pressure for the restoration of parity and caused concern on the part of the board over morale and recruiting. When parity was restored both sides became more concerned with other matters.

A shift in Bamin policy occurred with the adoption of a single salary fixed increment type schedule in 1967/68. The policy's exact nature was not easy to determine since only two years of data were available and both of them were associated with unique factors. Apparently, comparison pressures have been keeping Fox Point's Bamin more in line than previously.

The discrimination net representing Fox Point's Bamin policy is presented in Figure 5a. Initially, it is determined whether the decision is being made for any year before the policy break. If this is true, the old policy is in effect and the current Fox Point salary (B) is compared to the other areas'. If none are lower the model's prediction of the Bamin increase (IB) is the average of the earlier settlements for the coming year (AVES) minus the current salary. If B is not at the bottom of the list then IB is $100 less.

If initially it is determined that the decision is being made for 1967/68 or after, IB is set equal to AVES minus B. Finally, the model moves on to consider the effect of constraints common to all districts.

There are three errors greater than 25 percent. For 1967/68 the actual increase is $250 more than predicted (55.6 percent error). In that year the school board decided to become salary schedule leaders in the north side. Apparently, there was some desire to bring teachers' salaries more in line with other occupations', and perhaps to discourage the teachers' association from applying for recognition as collective bargaining agent. Also, teachers throughout the north side were more determined than in previous years especially here where they could point to relatively low cumulative earnings.

The 1968/69 decision no longer reflected a desire for leadership. The previous year's choice had led to repercussions from citizens and other school boards. The teachers' association had obtained permission from the state to be formally recognized. Finally, Milwaukee gave an extraordinarily large increase.

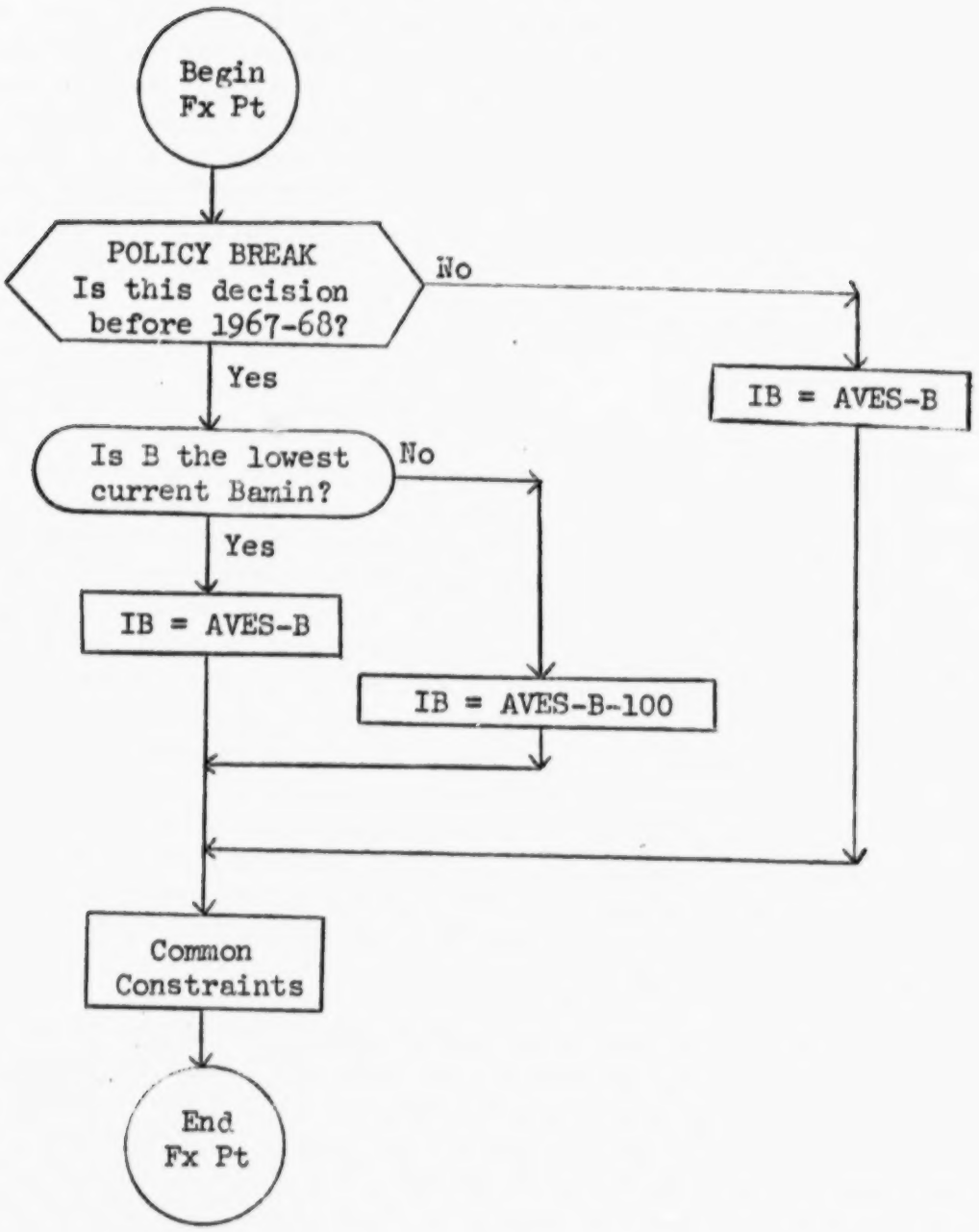

Fig. 5a FOX POINT-BAYSIDE

The other two large errors occur in 1962/63 when the actual increase is $40 less than predicted (-26.7 percent error) and in 1965/66 when the actual increase is $50 more than predicted (33.3 percent error). These can be reduced to 0 and 16.7 percent ($25 discrepancy) respectively, and smaller gains can be made in other errors, by weighting the Bamins of Glendale, Mapledale and Whitefish Bay five times more than the others under the old policy. Their influence, discovered in the interviews, is based partly on being the only systems contiguous to Fox Point. In addition, Glendale and Mapledale are the only other elementary school districts. The fact that this influence seems to have been lost under the new policy may be due to the more rapid and complete dissemination of salary information in recent years. Weighting the three Bamins is not considered in the model because the reduction in errors is balanced out by the addition of more parameters.

Glendale-River Hills

Glendale also had two different policies with the break occurring in 1963/64. The earlier strategy, associated with a fixed increment schedule, can be succinctly stated as desiring to be a Bamin leader in the area. No district had a higher Bamin in 1960/61 and 1962/63, while in 1961/62 Glendale was second by $25 to a district that settled after it. The board felt that since this was a relatively new system, being organized from a collection of smaller ones in 1954, the policy was needed to attract teachers. Once more, recruitment needs were high due to increasing enrollments. The relatively high industrial tax base (see Table 1) was helpful in the district's attempt to be a leader.

One particular aspect of the policy, implied in the above discussion, was to be at least equal to Milwaukee since it hired so many teachers. Moreover, teachers hired for the coming school year by that district could expect a salary increase four months after they started when the new calendar year began.

The new policy was inaugurated with the change to a "modified" index schedule. The bachelor's column was based on fixed increments up to the fourth step (the tenure level). This point served as the base of an index system for the remaining steps. The master's column was determined by adding a fixed amount to the bachelor's salaries. The Bamin, however, still exerted a strong influence on the rest of the schedule because the tenure salary was increased by the same amount in every year except 1968/69.

The new strategy was characterized by a shift in emphasis from the Bamin to the upper parts of the schedule. One reason for the shift was the lesser importance attached to a high Bamin as the district began to develop a reputation where it recruited. In addition, as more of the teachers moved to the upper portions of the schedule pressure became stronger to reallocate financial resources in that direction.

The flowchart for Glendale appears in Figure 5b. First, the model inquires whether the decision is being made for the policy break year,

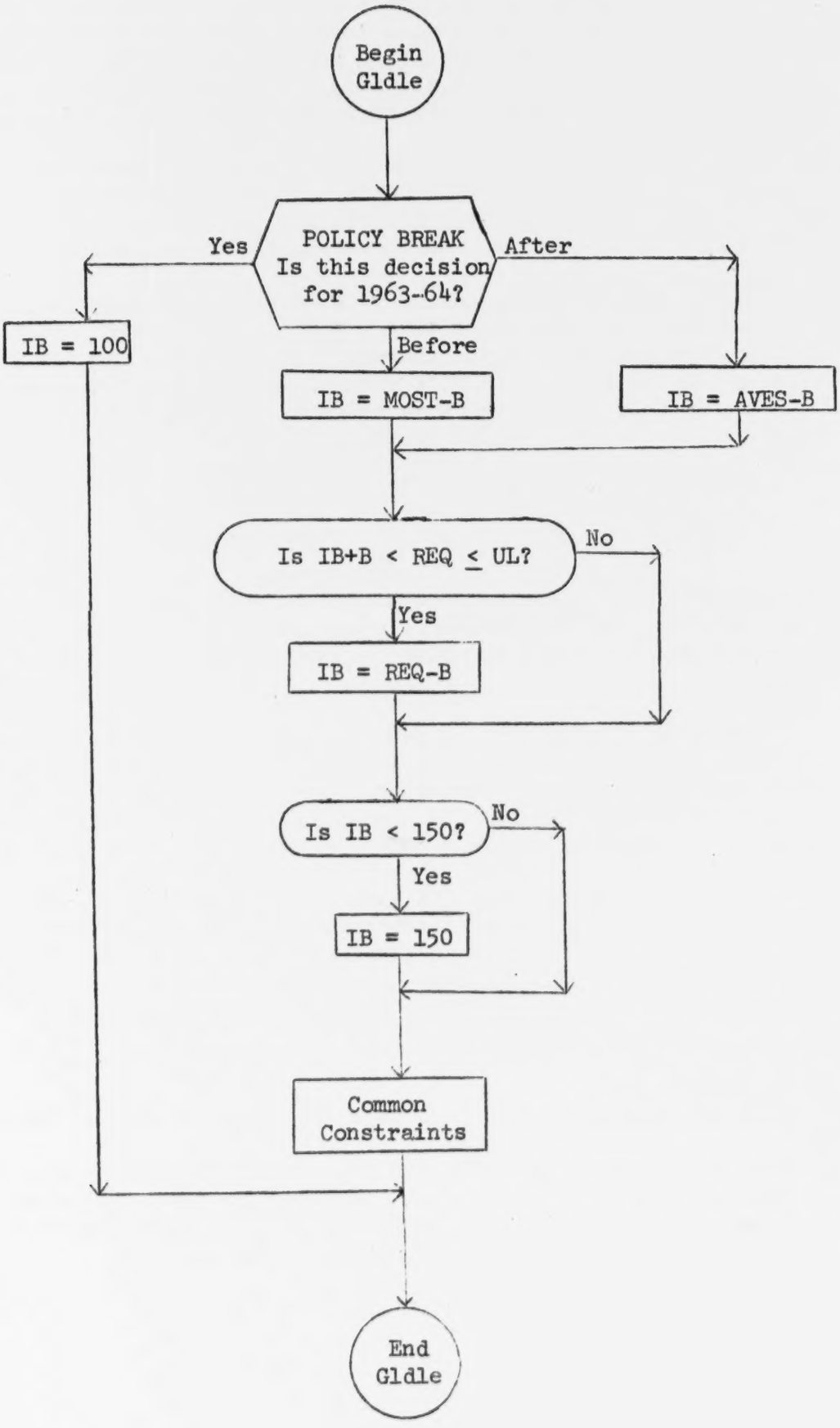

Fig. 5b GLENDALE-RIVER HILLS

1963/64. If it is being made for a previous year the Bamin increase (IB) is preliminarily set equal to the largest salary of those districts which have already settled for the coming year (MOST), minus the current Bamin (B).[27] If the decision is being made for after 1963/64 it is preliminarily set equal to the average of the earlier settlements (AVES) minus B.

Next the model considers whether IB should be affected by the teachers' Bamin request (REQ). This involves discovering if REQ is higher than the preliminary decision (IB+B), but lower than some allowable upper limit (UL). If so, it is considered reasonable and accepted.

UL was determined by assuming it would be the same as the upper limit of the allowable range within which a district in the k^{th} position will tend to settle. It was therefore necessary to specify a particular value of UL for each value of k even though the range's upper limit may not be precisely determined when k=3,4,5. The expression which was developed is:[28]

$$UL = MOST + 93.8 - 18.8(k-1) \qquad k=3,4,5$$

$$= MOST \qquad =6,7$$

The parameters of the upper equation were determined by calculating the least squares line through the average high violation data of Table 3a for k=3,4,5. The lower equation is also based on the results of that table.

The model's next step is made to insure that IB is at least $150 and then the common constraints are handled. Provided the decision is being made for the policy break year the Bamin increase is $100 reflecting the considerations peculiar to such a year which were discussed earlier. There is no handling of the common constraints if this path is taken.

No errors greater than 25% existed for the Glendale discrimination net. The district's fiscal dependence upon the city council does not seem to have had any effect on the Bamin decision. The respondents did feel that budget estimates tended to be overestimated as a precaution, but the exact figures are not made known to the teachers.

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27 At least Milwaukee must have made its decision before Glendale.

28 When k=2 there is no basis for determining a value of UL. However, Glendale never settled second over the time period studied. This issue therefore is not a problem in testing against past data, but must be dealt with when predicting the future.

Mapledale-Indian Hills

According to the data Mapledale, the smallest of the districts investigated, exhibited two different types of policies with the break occurring in 1966/67. The interviews however did not provide clearcut substantiation of this event possibly because the new policy was an intensification of the old rather than a marked departure from it. A change from increments with at most three different values to increments with different values at almost every step in the schedule accompanied the break.

Most respondents agreed that under the old policy the Bamin was set with a view towards just staying in the general vicinity of the other districts. One of the reasons was that Mapledale found itself with more than enough teachers without bachelors degrees and not enough experienced B.A. and M.A. teachers. Hence, emphasis was placed on strengthening the salaries in their portion of the schedule. For example, throughout these years raises and/or increments were often greater for M.A. as opposed to B.A. teachers and tenured versus non tenured teachers.

The schedule developed for 1966/67 had the largest increments (as high as $550) in the middle. As a result salaries in that portion of the schedule and above tended to be on the high side but those near the bottom were low. This new emphasis on the middle and continued deemphasis of the bottom was intended to give teachers relatively high salaries fairly early in their careers but not before tenure was granted.

The Mapledale decision process is portrayed in Figure 5c. If the decision is being made for a year previous to the policy break the Bamin increase (IB) is the average of the earlier settlements (AVES) minus the current Bamin (B). When the decision is being made for a year after the break IB is $100 less. Next a check is made to see that IB is at least $100 and then the common constraints are handled. In the policy break year a $100 increase is used.

The only large discrepancy occurs in the policy break year (1966/67) when the Bamin prediction is $100 and the actual increase was only $50. This may have led to a limiting of salary increases throughout the schedule but there was not enough data to determine whether it happened. A change in schedule philosophy, setting increments to be multiples of the Bamin, lasted from 1963/64 through 1965/66. It did not result in a policy break, but only minimums and maximums were raised in 1963/64 implying a limiting of the salary increase.

Nicolet

Nicolet is the one district for which there was no evidence of a policy break. Its strategy can be summarized as attempting to be neither a leader nor a follower. A major component according to the interviews is the following. If the district currently has the highest Bamin it will give a little bit less than the average increase its neighbors are

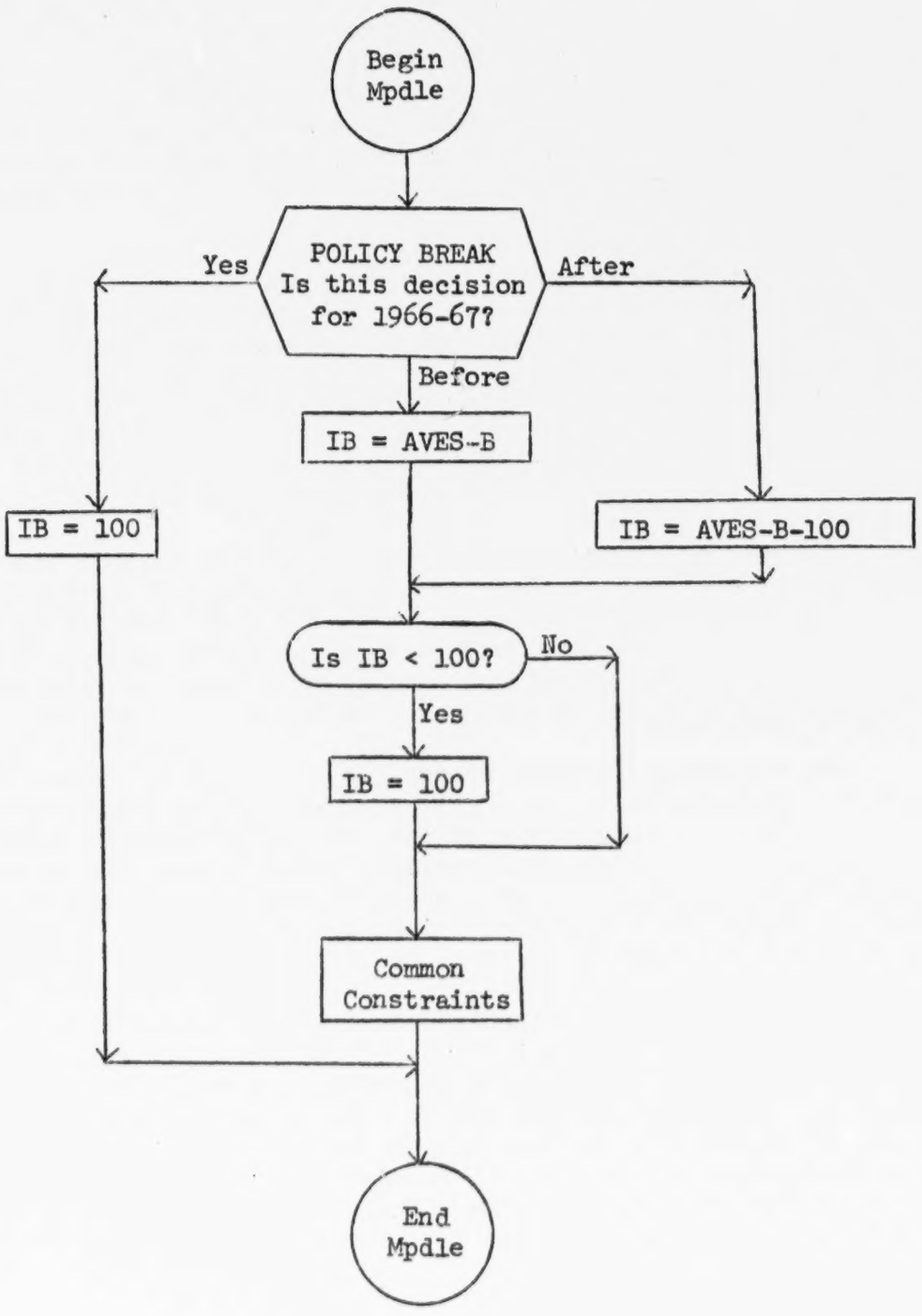

Fig. 5c MAPLEDALE-INDIAN HILLS

giving. If it currently has the lowest Bamin it will provide a little bit more than the average increase. And if it is at neither of these two extremes it will tend to give the average increase. It should take only a little reflection to see that this strategy is substantially the same as choosing the average of the coming year's salaries. The policy also involves the use of smoothing constraints; upper and lower limits on the amount of increase in order to reduce year to year variation.

Figure 5d incorporates the above ideas into a flowchart of the Nicolet decision. Initially, the Bamin increase (IB) is the average of the earlier settlements (AVES) minus the current Bamin (B). However, if the increase is less than $100 it is set equal to $100. If it is greater than $300 but not more than $400 it is set equal to $300. Otherwise, there is no change. The reason that a value of IB greater than $400 is not constrained is to prevent Nicolet from falling too far behind the other systems when they give relatively large raises.

The discrimination net produced two errors greater than 25%. For 1961/62 the prediction understates the actual increase by 36 percent or $108. Here, it seems that the strategy outlined above was used, but comparisons were made to a wider group of districts. In addition, Nicolet found itself at the bottom of the north side districts for the second year in a row and was undoubtedly anxious to avoid a repetition.

The second large discrepancy occurs for 1964/65 when the prediction overstates the actual raise by 52% or $79. This is the only time a district settled in the sixth or seventh position and violated the allowable range. Here, the board agreed for the only time over the nine year period to grant a percentage across the board increase. It is possible that the percentage's value was chosen to give lower increases than usual at the bottom of the schedule in order to avoid raises much higher than ordinary at the top.

Since Nicolet is a high school district it might be argued purely from labor market considerations that it should not be influenced by the salaries of the three feeder elementary districts. However, there is influence exerted for the same reason that they are affected by Nicolet. Almost all high school teachers in the state, being in K-12 systems, earn the same amount as elementary teachers with the same educational background and experience. Consequently, Nicolet's board will not want to go much higher than, nor its teachers much lower than the Bamins of the elementary systems. Assigning various combinations of higher weights to the three K-12 systems increased Nicolet's overall error in all cases. Weighting the elementary districts actually reduced the overall error in some cases. Once more, there was a significant drop in the 1961/62 error discussed above. However, the gain was not considered sufficient to overcome the addition of three more parameters to the model.

Finally, even though no policy break was found there has been some change in schedule construction. In the early part of the time period there was a fixed increment schedule with across the board increases. Lately, the policy has been to determine minimums and maximums and then the steps inbetween. This means no across the board raises and different increments each year.

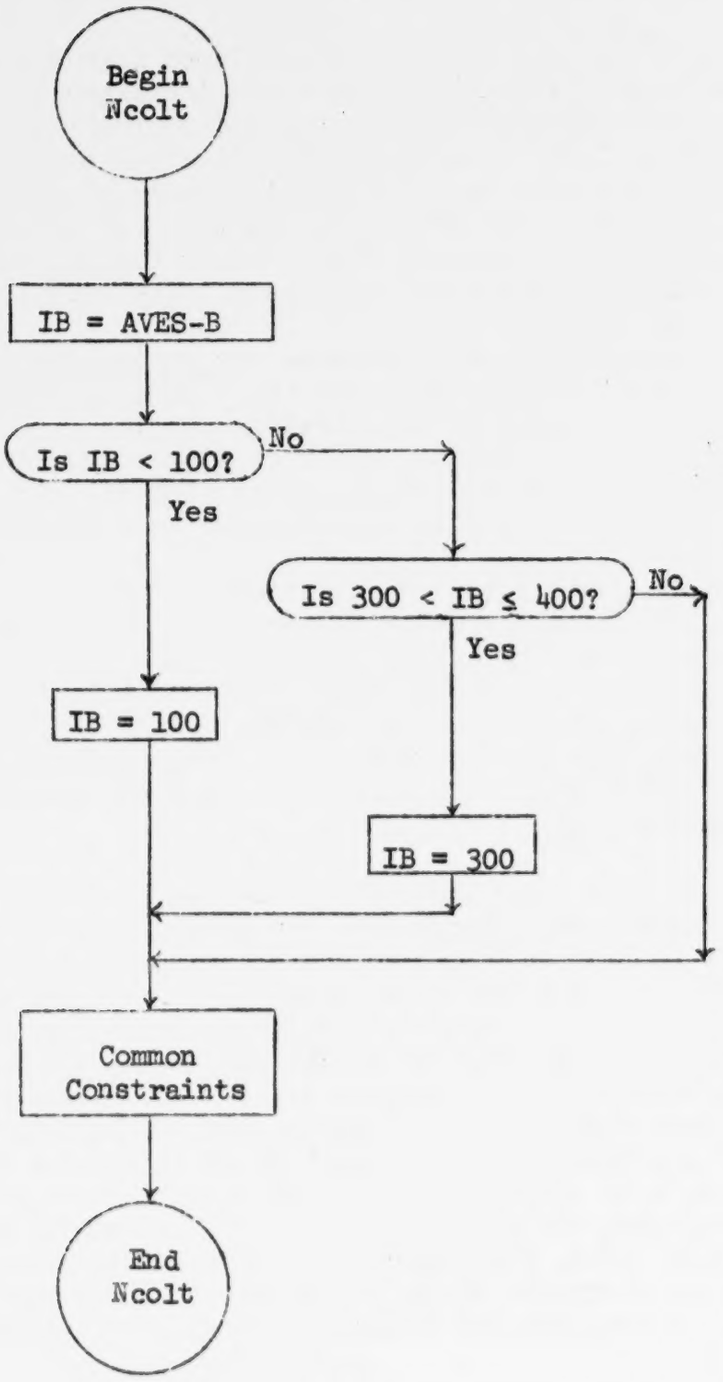

Fig. 5d NICOLET

Shorewood

Shorewood's policy break occurred in 1962/63. Prior to that time the board was primarily interested in attracting master's degree teachers or bachelor's degree teachers with the stipulation they would soon get their advanced degree. This attitude was reflected in the fixed increment schedule. The bachelor's column, especially its lower portions, did not receive the emphasis given to the master's column, especially its upper portions. A second factor making for a relatively low Bamin was the existence of a dependency allotment over and above the schedule with which it was hoped to recruit male teachers.[29]

In 1962/63 Shorewood converted to an index schedule. Except possibly in that year all the elements of the salary matrix have been expressed as multiples of the Bamin. The changeover was made at the request of the teachers many of whom were in the upper portions of the schedule. However, the board has reserved the right to change the multiples and has done so on four of six possible occasions. Consequently, the Bamin increase has not in general been the sole determinant of raises elsewhere in the schedule.

Nevertheless, the Bamin achieved greater significance from this point on. Recruiting problems, difficulties in attracting highly qualified teachers, called for more attention to the lower parts of the schedule. It is also possible that the board's decision to reduce the dependency allotment had the same effect.

The Shorewood discrimination net is shown in Figure 5e. It begins by inquiring whether the decision is being made for the policy break year. If before, the Bamin increase (IB) is preliminarily set equal to $100 less than the average of the earlier settlements (AVES) minus the current Bamin (B). Provided the decision is being made for a year after 1962/63 IB is preliminarily set equal to AVES minus B.

At this point the model examines whether the teachers' Bamin request (REQ) may alter the preliminary decision (IB+B). The procedure is the same as for Glendale. Provided the request is between IB+B and the allowable upper limit (UL) it is accepted.[30] Next a check is made to ensure that IB is at least $100 and then the common constraints are handled. If the choice is being made for 1962/63 IB is $100 for reasons already mentioned.

There is one large error representing a predicted increase for 1964/65 which is 50% or $75 greater than the actual increase. Unfortunately, it was not possible to discover why it occurred. The relative

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29 The allotment was $225 extra for one dependent and $450 extra for more than one dependent.

30 Shorewood did settle in the second position once but since the teachers request was unavailable it was not necessary to consider the issue.

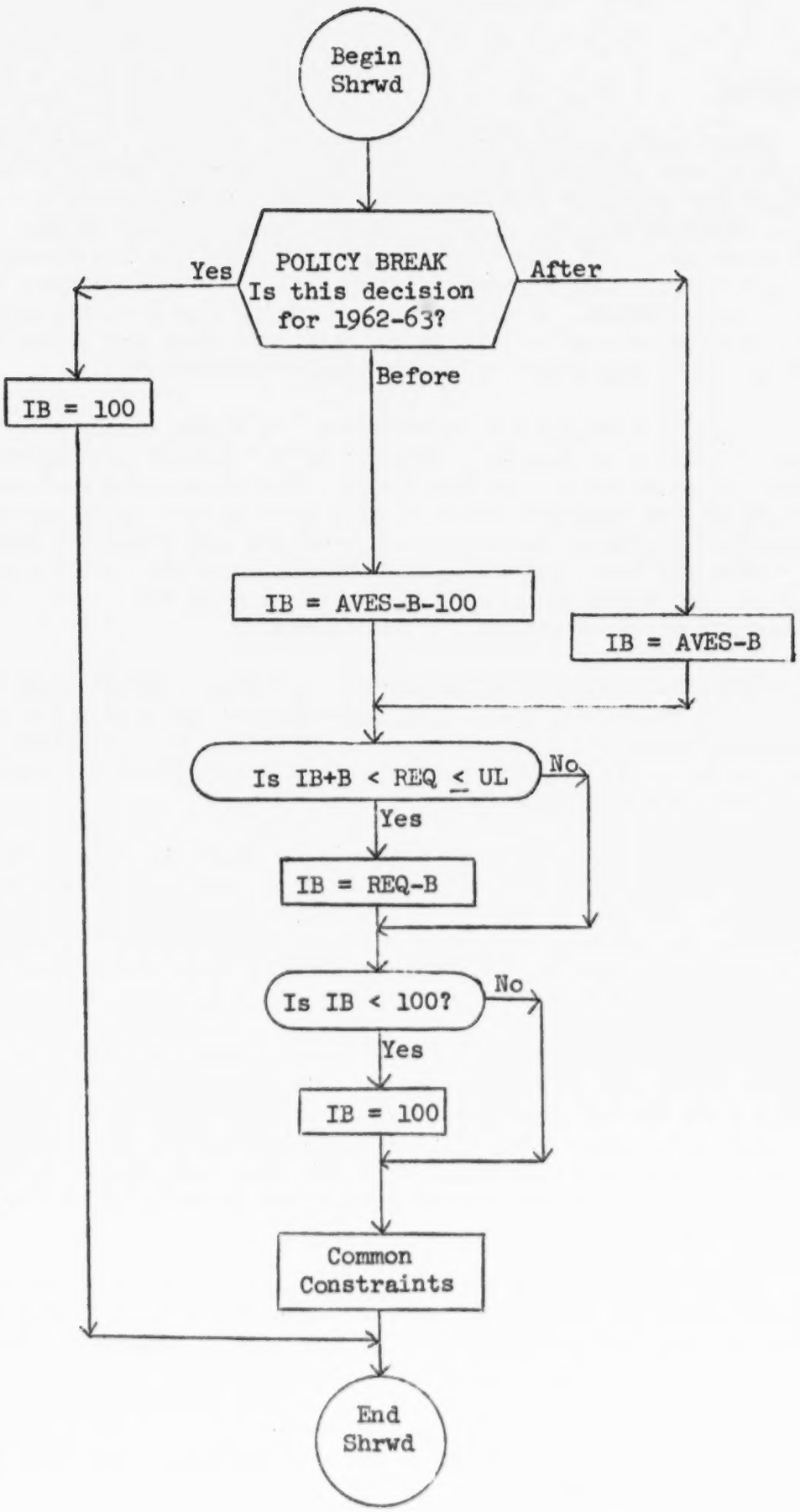


Fig. 5e SHOREWOOD

early establishment of formal collective bargaining (1965/66) did not seem to exert an effect on decision making. Most respondents felt that there was not much in the way of actual negotiating until 1968/69.

Whitefish Bay

Whitefish Bay, the last district to be analyzed, underwent a policy break in 1962/63. In that year it also shifted from a fixed increment schedule to one in which teachers received 5 percent of their current salary or $400 (whichever was lower) as an increment and then an across the board raise.

The old Bamin policy was to stay in the middle of the salaries of the other areas. In fact one respondent's impression was that the board tended to average its neighbors' salaries. The interviews also revealed a feeling that it was unnecessary to go above the Milwaukee Bamin to attract teachers due to Whitefish Bay's well-established reputation.

The new strategy, which was to insure that the Bamin was a small amount over Milwaukee's, pushed the district into a position of leadership in the area. In the first four years of its existence no other district's was higher. There were two primary reasons for the strategy. As in Shorewood, recruiting highly qualified teachers was becoming more difficult. Most of the people interviewed also agreed that status considerations were involved. Since Whitefish Bay was ahead of Milwaukee on so many status characteristics they felt it incongruent to be behind on the highly significant Bamin dimension.

Whitefish Bay's flowchart appears in Figure 5f. First an inquiry is made to see if the year being predicted is subject to a policy break. If the year is before the break, Milwaukee's Bamin (MB) is compared to the average of the earlier settlements including Milwaukee's (AVES). If MB is larger the new Bamin is AVES; otherwise, it is MB. The latter path plausibly assumes that MB was never a great deal lower than the suburbs' salaries.

If the year being considered occurs after the break an inquiry is made to see whether AVES is less than MB plus $50. Confirmation allows the new Bamin to be set equal to MB plus $50 which plausibly assumes Milwaukee will not wind up much higher than the suburbs. If AVES is greater than MB plus $50 then AVES is used in order to ensure that the district remains conpetitive when the other suburbs go above Milwaukee on the average. The common constraints are handled next, and in the policy break year the increase is $100.

The 1962/63 error is an indeterminate quantity since no increase was actually given. The $100 discrepancy can be explained by those factors which were used to account for small raises in policy break years.

It is possible that the initiation of the new strategy was due more to the beliefs of individual board members than to the schedule change.

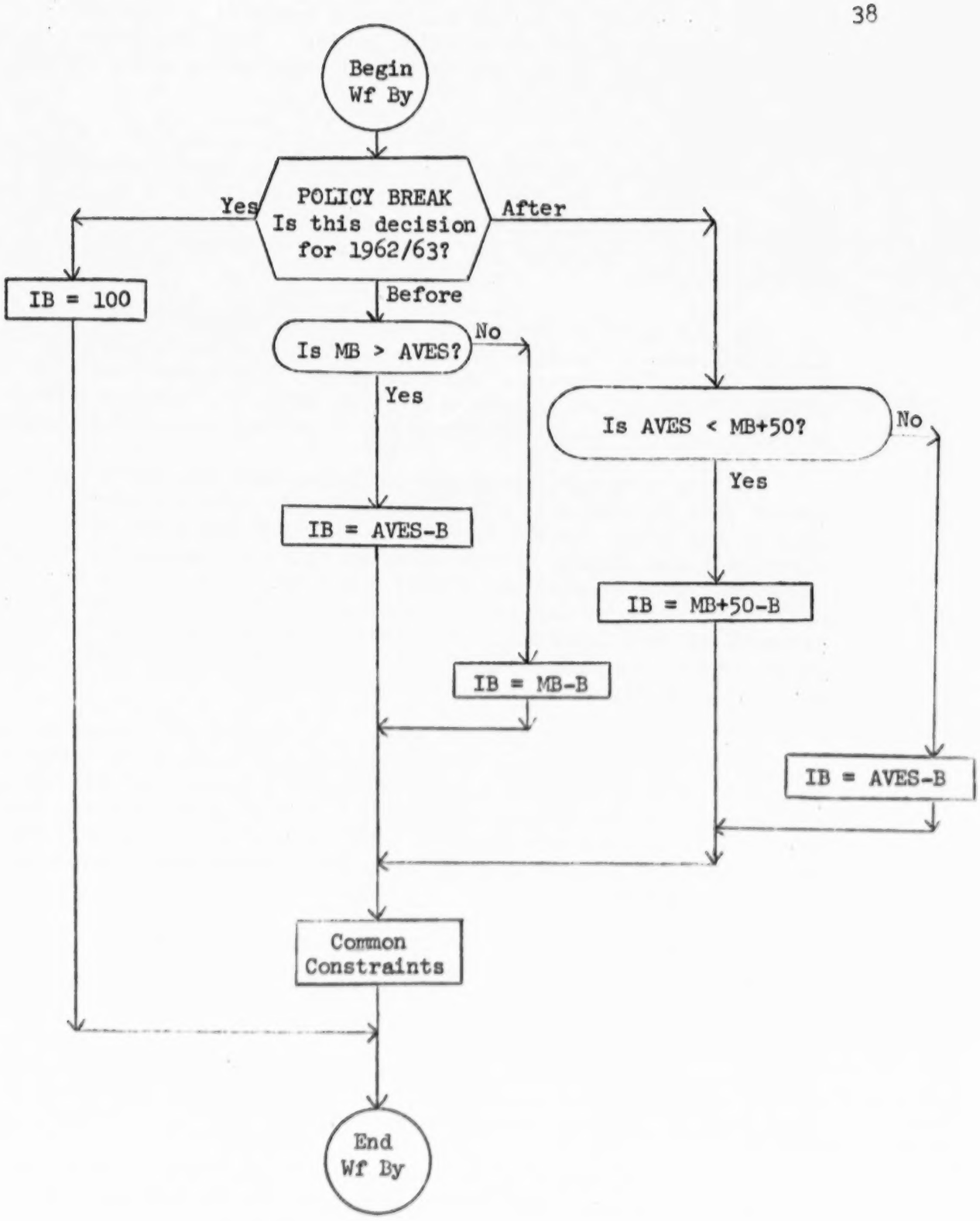


Fig. 5f WHITEFISH BAY

By coincidence, the person to whom the strategy was attributed joined the board in the same year that the decision was made to put it into effect.

Common Constraints

The final section of the model involves two sets of constraints to which all the districts must adhere.

The first set reflects the pattern recognition phenomena. Since the upper and lower limits of the range faced by districts settling in the third, fourth and fifth positions tend to be hazy guidelines, they are not considered as constraints in the model. However, systems deciding in the six or seventh positions regard the ranges they face as setting definite limits which are not to be violated. This behavior is incorporated into the model in Figure 5g. Initially, it must be determined whether the district being considered has settled sixth or seventh. If true its new Bamin up to this point in the process (IB+B) is compared to the range's upper limit (UL=the largest salary to date). If IB+B is greater it must be decreased until it equals UL. Otherwise, a comparison of IB+B to the lower limit (LL=the smallest salary to date) is made. If it is less it must be increased until it equals LL.

The second set of constraints deal with the effect on the suburbs of Milwaukee's giving an extraordinarily large raise. It is pertinent for the model's treatment of the 1968/69 situation when the city's Bamin of $6800 represented a $950 increase.

Prior to the Milwaukee settlement the metropolitan school boards association formed a negotiations committee for the purpose of sharing information. After the settlement most of the boards represented wanted to hold their Bamins below $6800. In particular, those primarily in the southern part of the county wanted to try to hold initial proposals to $6300 and their Bamins to $6500. Whitefish Bay, however, the first suburb in the county to settle, deciding it could not be more than $100 below Milwaukee, chose $6700. With this decision a rule of coming no closer than $100 to the city's Bamin was established. Only one suburb in the county, Shorewood, violated it ($6750).

The rule is built into the model in Figure 5g. Milwaukee's Bamin increase (IMB) is checked to see whether it is greater than or equal to $500. This parameter representing an unusually large raise may have a value anywhere from $300 (the city's largest Bamin increase prior to 1968/69) to $950. If IMB is greater than or equal to $500, IB+B is compared to Milwaukee's Bamin (MB) minus $100. If IB+B is greater it is reduced until it equals MB minus $100.

Tests of the Model

Two general procedures were followed in validating the model. First, a comparison between the actual and predicted increases was made, and

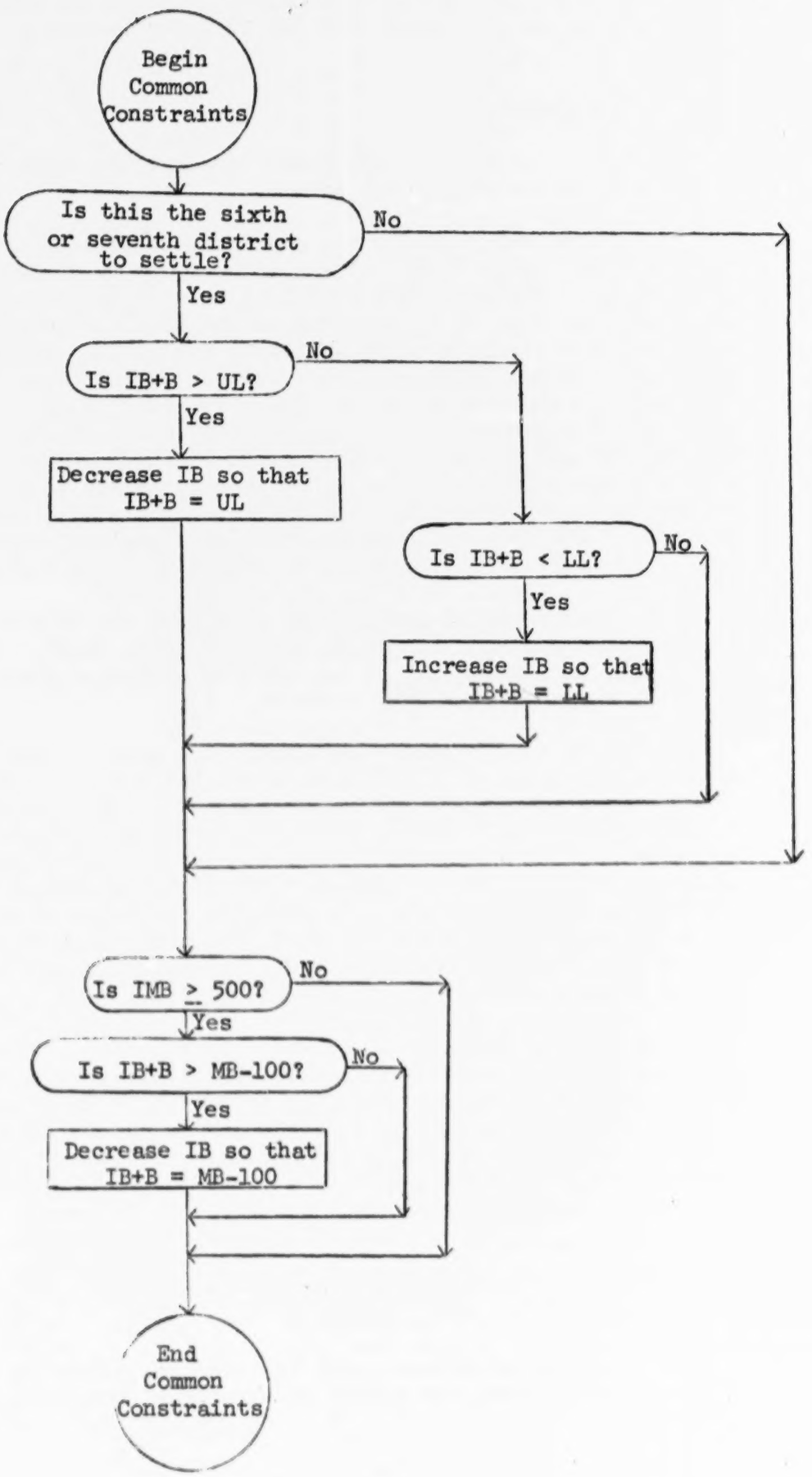


Fig. 5g COMMON CONSTRAINTS

second the predicted increases were compared to those of alternative theories. In all cases tests were conducted on the same data from which parameters were estimated (1960/61 to 1968/69).

The first procedure assumes that the relationship between the j^{th} district's actual increase (A_{jt}) and its predicted increase (P_{jt}) in year t is given by the linear model:

$$A_{jt}=\alpha_j+\beta_j P_{jt}+e_{jt}.$$

Here, e_{jt} is a random error normally distributed with mean zero and constant variance. Ideally, $\alpha_j=0$, $\beta_j=1$ and $e_{jt}=0$, for then:

$$A_{jt}=P_{jt}$$

implying perfect predictions. The extent of agreement between the actual and predicted values is determined by the degree to which this ideal is reached.

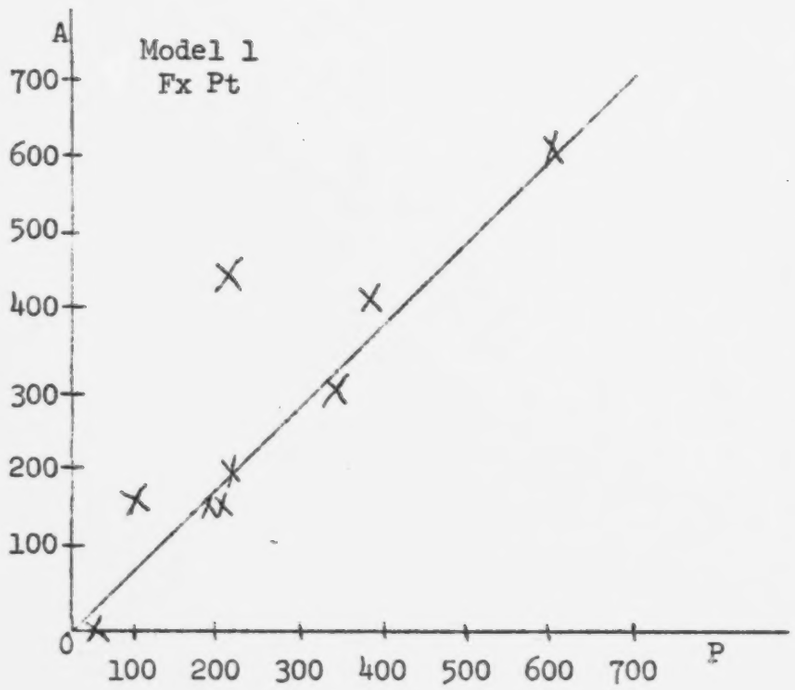
A visual presentation of the similarity between A_{jt} and P_{jt} is found in Figure 6 which contains plots of these two variables for Model 1 and Model 2. In all cases the line of perfect predictions $A_{jt}=P_{jt}$ is included as a standard against which the points can be judged. Considering Model 1 only, there is, with an occasional exception, close agreement between the points and the line. This seems to be most true for Whitefish Bay. In the case of Model 2 the resemblances are less marked as is to be expected. Again, Whitefish Bay appears to fare best.

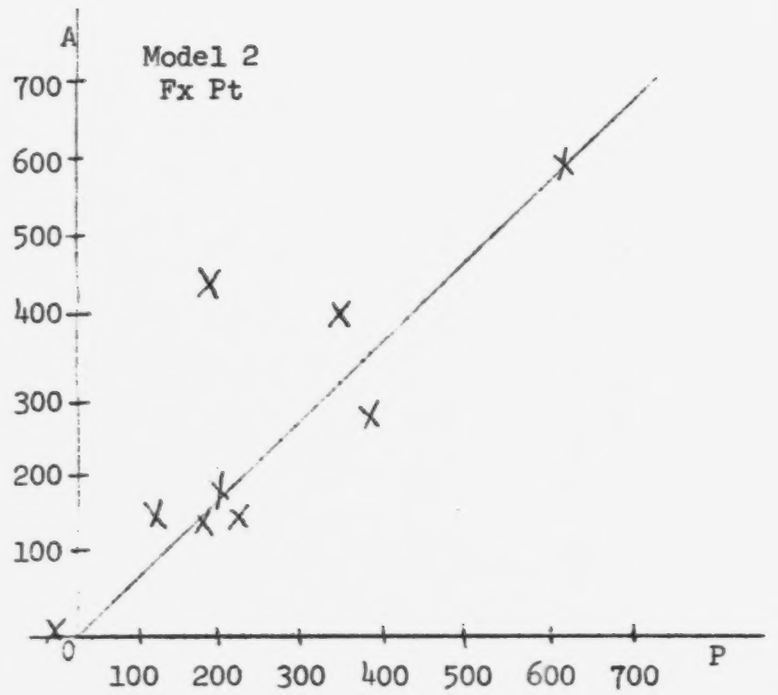
In addition to a visual presentation it is possible to develop some statistical evidence through the use of regression analysis on each district in both versions of the model. Table 4 shows the resulting values

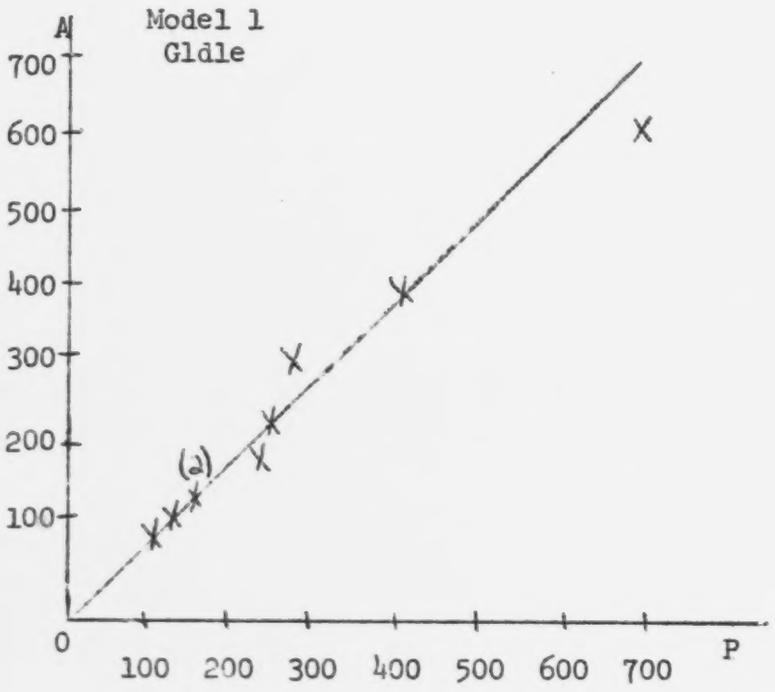
TABLE 4

Statistics for Comparing Actual and Predicted Increases

	MODEL 1			MODEL 2		
	a_j	b_j	r_j	a_j	b_j	r_j
FX PT	31.6	0.99	0.88	36.5	0.93	0.86
GLDLE	27.2	0.85	0.99	47.8	0.82	0.92
MPDLE	- 8.3	0.98	0.99	- 4.2	0.98	0.94
NCOLT	- 6.1	1.01	0.98	4.8	1.00	0.90
SHRWD	-43.4	1.17	0.98	-11.4	1.10	0.95
WF BY	-31.5	1.07	0.99	-20.5	1.08	0.97







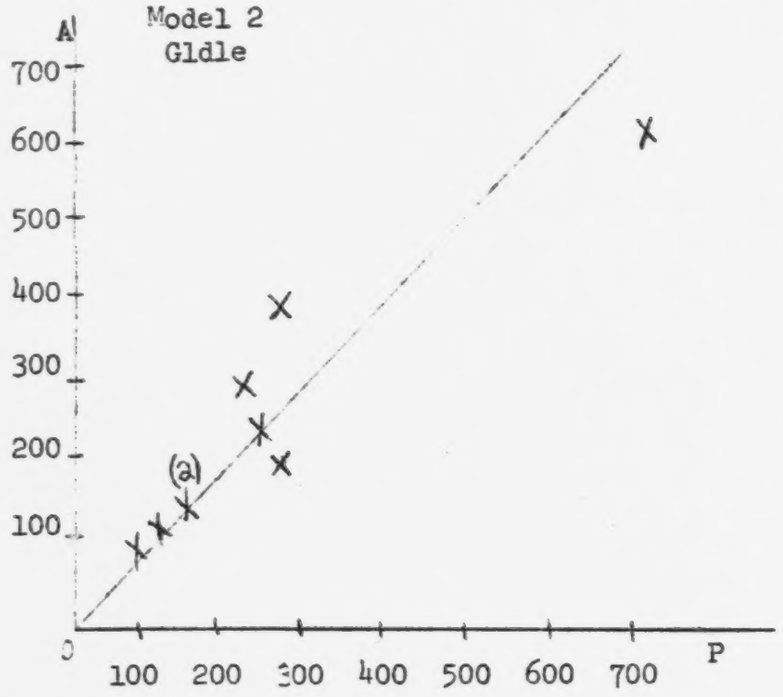
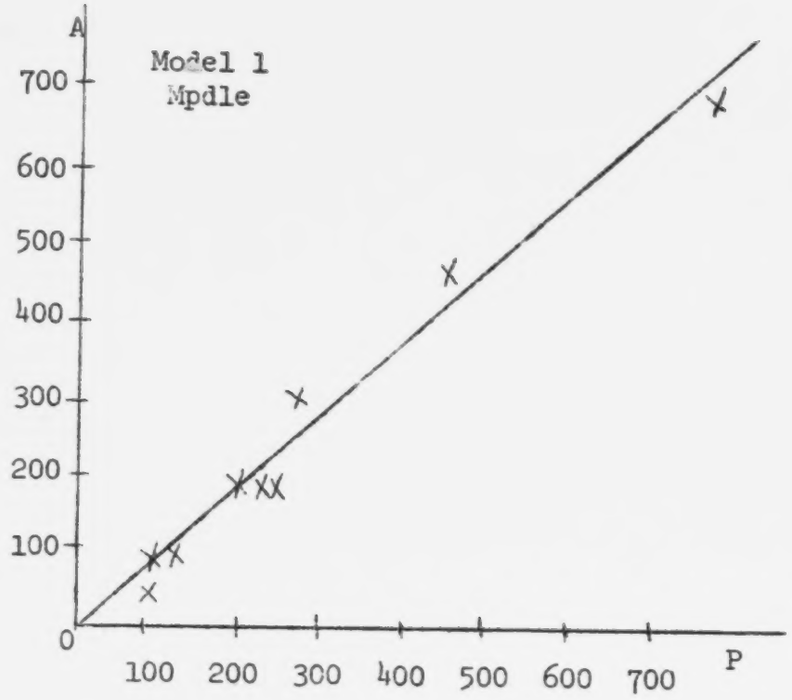
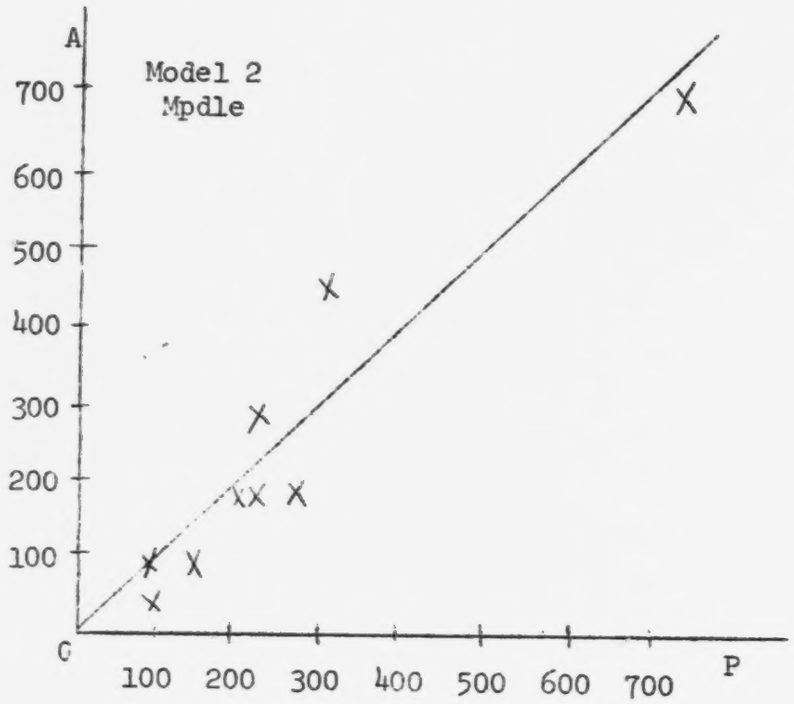
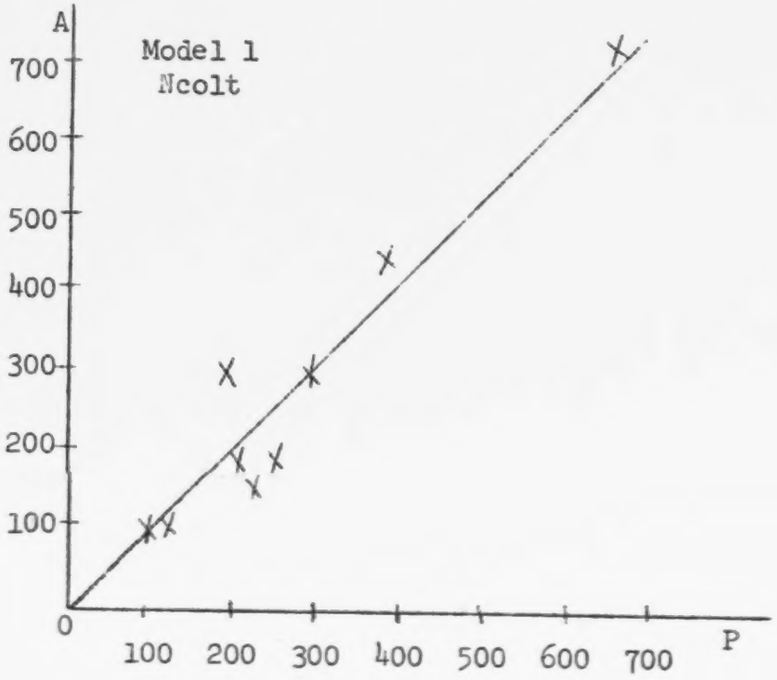


Fig. 6 ACTUAL INCREASES VS. PPEDICTED INCREASES







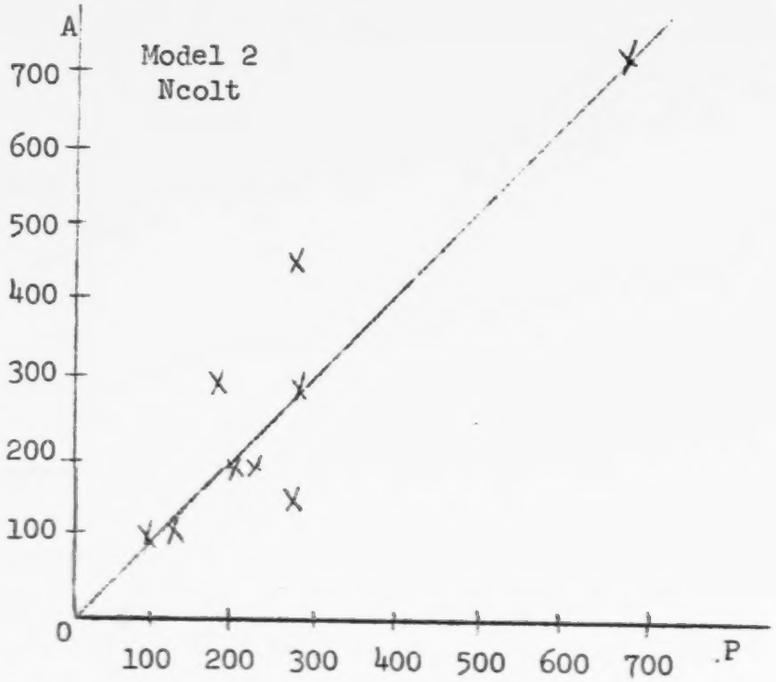
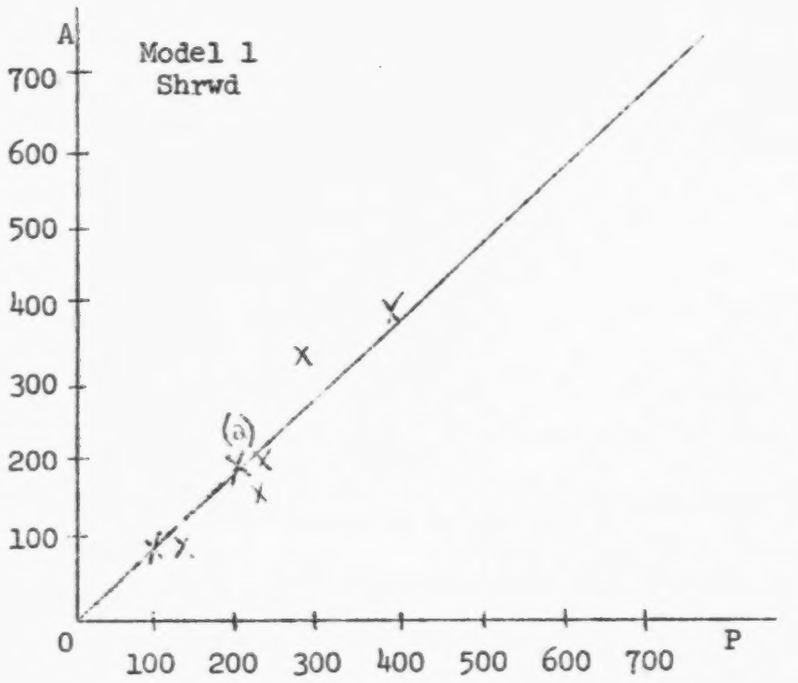
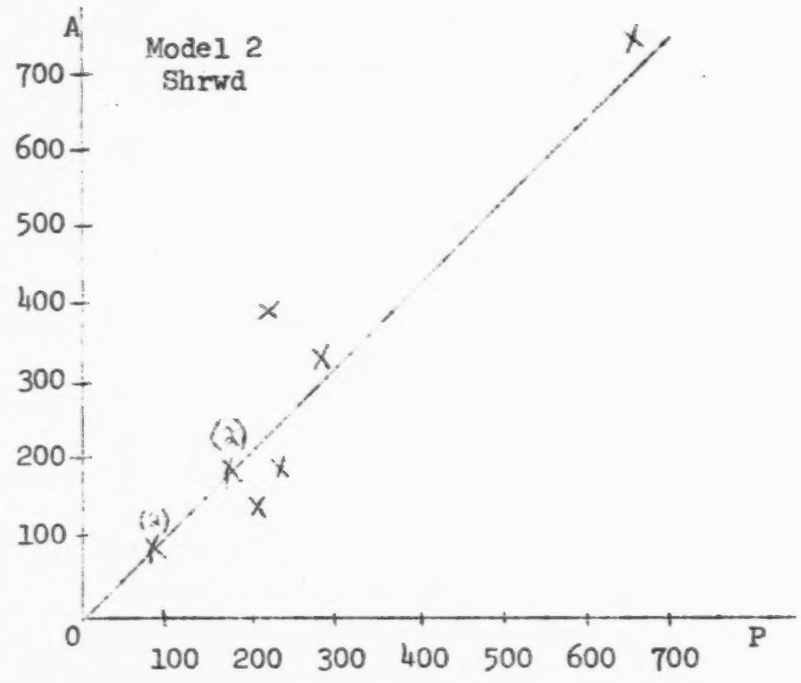
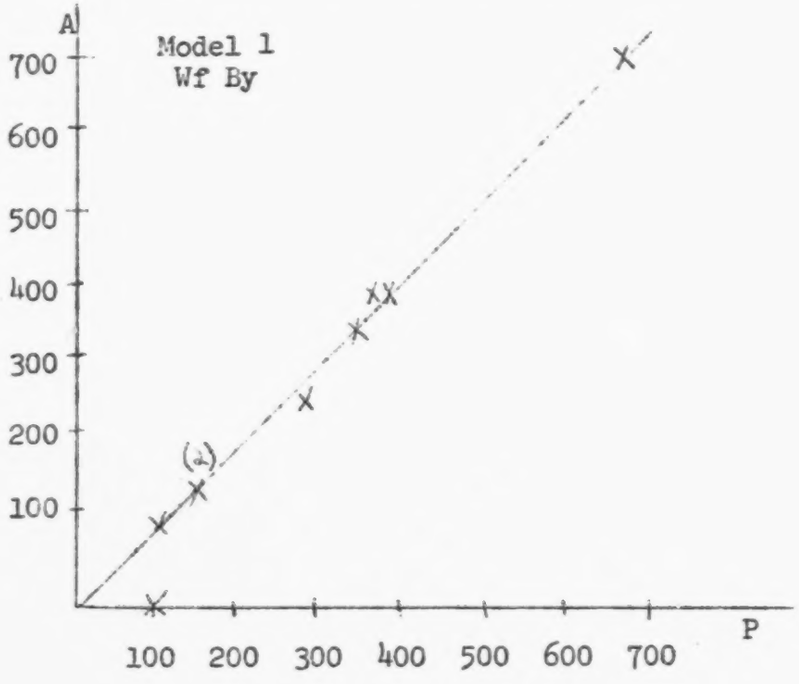


Fig. 6 (continued)







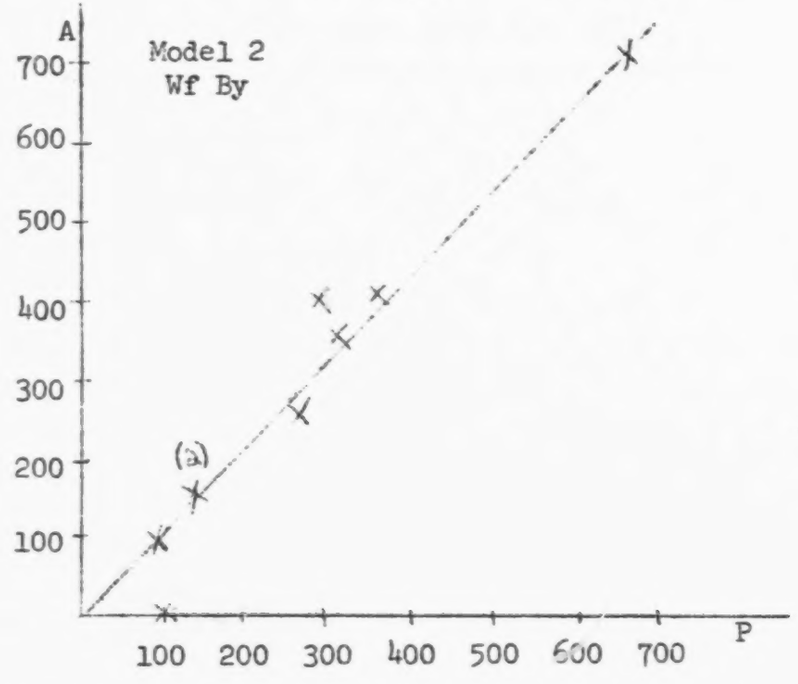


Fig. 6 (continued)

of a_j (the estimate of α_j), b_j (the estimate of β_j) and r_j (the estimate of the correlation coefficient). Three different statistical hypotheses were investigated each at the 5% level of significance. The usual analysis of variance test indicated a relationship existed between A_{jt} and P_{jt} in all twelve instances. A test of the hypothesis $\alpha_j=0$ using the t statistic was accepted in all cases. A t test of the hypothesis $\beta=1$ was accepted for five of the six districts in the Model 1 version. The exception was Glendale and the plot in Figure 6 suggests the problem is due mainly to one errant observation. The same test involved no rejections in the Model 2 version. Some indication of the magnitude of the random variation about the regression line relative to that of the dependent variable can be obtained by examining r_j. Model 1's values are all above 0.98 except for Fox Point, while Model 2's values are all above 0.90 except for the same district. Figure 6 suggests that Fox Point's relatively high random variation is chiefly due to a single point.

In the second part of the testing procedure the model's predictions were compared to those of alternative theories. The error measure used for each district was the "standardized absolute error":

$$100 \cdot \frac{\sum_t |A_{jt}-P_{jt}|}{\sum_t A_{jt}}.$$

A measure of the model's predictive accuracy for all the districts, the "overall standardized absolute error":

$$100 \cdot \frac{\sum_{jt} |A_{jt}-P_{jt}|}{\sum_{jt} A_{jt}}.$$

is also used. Clearly, a value of zero for either measure indicates perfect predictions, while a value of one indicates the predictions are no better than assuming the Bamin does not change.

The first alternative theory, which I have termed the "wage leader" hypothesis, is taken from the labor economics literature.[31] Milwaukee, due to its being such a large employer of teachers in the locality will face an upward sloping labor supply curve. Accordingly, the determination of a Bamin rate will be subject to its discretion instead of the market's. The suburbs, each of which is a very small employer of teachers will adopt the rate set by the central city. Going below means losing teachers while it is not necessary to go above in order to meet recruitment needs.

The wage leader theory was operationalized by using Milwaukee's Bamin as the prediction for each of the suburbs. This formulation

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31 Allan M. Cartter and F. Ray Marshall, Labor Economics: Wages, Employment, and Trade Unionism, Homewood, Ill.: Richard D. Irwin, 1967, p. 256.

assumes no institutional barriers to the flow of teachers. In addition, the ceteris paribus condition applies to the quality of teachers, fringe benefits, and working conditions among the districts. Finally, it must be remembered that the effective Milwaukee Bamin on a school year basis is higher than the calendar year figure used since teachers receive a raise four months after they begin work.[32]

A second alternative will be referred to as the institutional theory and is taken from Johnson's explanation of its meaning.[33] Teachers' satisfaction with their raises depends upon whether or not they maintain their relative wage position. An increase in the wages of any one system, which will usually affect its entire schedule, will lead to corresponding raises in the other districts' schedules. This means that Bamin rates will move up together or in other words that relative Bamin salaries will exhibit a great deal of inflexibility. Since, Milwaukee always makes its decision first, one variation of this theory is to assume that all the suburbs raise their Bamins by the same percentage as the central city.

The third alternative, an "incremental" hypothesis, is used because it contradicts the model's assumption that salary decisions are interdependent. This theory bases its predictions on each district's past history of increases. Specifically, the Bamin change is set equal to the last actual increase. As a result, only the last eight of the nine years of data are tested.

Due to the manner in which the error measure is constructed there is implicit consideration of a fourth alternative. A prediction of no change in the Bamin will produce SAE and OSAE values of one hundred.

A comparison of the values of the error measure appears in Table 5. Considering Model 1 only, there is a fairly wide range of error running from Fox Point's 19.0 to Whitefish Bay's 6.0. The former system's high value can be attributed mainly to a single year's error. Model 2's errors exhibit a slightly narrower range with the same systems acting as endpoints. As expected Model 2's errors are larger than Model 1's in all cases.

In comparing the two versions of the model with the alternative theories there is in general an increase in error as we move from left to right. The only exception is that the incremental hypothesis fares better for Nicolet than the institutional. Thus, the most important

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32 A variation of the wage leader hypothesis which used 0.4 x the current year's Milwaukee Bamin + 0.6 x the following year's Milwaukee Bamin produced much larger errors than the version chosen.

33 George E. Johnson, "Wage Theory and Inter-Regional Variation", Industrial Relations, Vol. 6, No. 3, May 1967, pp. 324-325.

conclusion to be drawn from Table 5 is that Model 1's and Model 2's errors are less, overall and on an individual district basis, than those of the alternative theories. Overall, Model 1 has 11.1/29.1=0.38 of the absolute error of its closest competitor, while Model 2 has 17.3/29.1=0.59 of the absolute error of its closest competitor. However, the model's favorable performance must be weighed against the fact that none of the alternatives involve any parameters estimated from the data.

TABLE 5

Error Measure Comparisons

	MODEL 1	MODEL 2	WAGE LEADER	INSTITU-TIONAL	INCRE-MENTAL
FX PT	19.0	21.0	35.4	39.5	60.0
GLDLE	7.1	16.8	33.0	40.2	45.6
MPDLE	9.6	20.4	28.3	40.4	55.0
NCOLT	12.2	19.5	26.0	43.5	36.4
SHRWD	12.8	15.4	26.5	44.3	51.1
WF BY	6.0	10.8	26.0	37.2	72.1
OVERALL	11.1	17.3	29.1	40.9	53.3

It is possible that a more rigorous determination of the model's parameters could have reduced errors even further. Due to the paucity of data Model 1's values were selected in a heuristic manner using the interviews and data as guides. Moreover, no attempt was made to separately estimate parameters for Model 2.

Conclusions

The purpose of this study was twofold. It was designed to contribute to our understanding of teachers' salary increases, and to suggest methodological techniques for studying relatively unstructured types of administrative decisions.

Methodology

In the area of methodology a technique for gathering data about the decision process was presented. It consists of obtaining protocols from individuals in a simulated environment. The simulation involves having them remake past decisions using the same information they had previously employed in the actual situation.

While the technique led to some useful findings, there were a number of difficulties connected with it. It was hard for many respondents to orally express their thinking. Often they silently perused the data and then blurted out an answer. Some respondents became confused between what they personally would have liked to have seen done and what the board actually did. Occasionally, they remembered the actual decision and then rationalized the reasons for it, while in other cases they projected imagined trends in the data. Finally, since the Bamin decision is made by a group the simulated interview should involve the group together instead of its members separately. However, in this particular study it was infeasible to do so.

On the other hand, the technique has advantages which mitigate the effects of retrospective bias. It furnishes information which aids the recall of circumstances surrounding particular decisions. It allows the collection of data from an actual (although simulated) decision making situation rather than an interview concerning what happened in the past. Moreover, a number of respondents became highly motivated due to the challenge inherent in guessing the right answer thus increasing their willingness to cooperate.

The second methodological technique investigated the sources and content of information used in the decision process. This procedure cannot for a number of reasons provide a complete picture. There may be confidential sources and types of data which individuals do not wish to divulge and which would not readily be found in a perusal of written documents. There may be factors which are important in some years but not in others. For example, when a major new piece of legislation affecting the salary decision process is passed, legislators, courts and lawyers will become important sources. It does not take into consideration the fact that data stored either in individuals' or the organization's memory (e.g. files) is also used in the process. Thus, board members and teachers have access to the previous values of information and also have knowledge of the pertinent institutional constraints.

One advantage of tracing information flows is that it helps specify the inputs to the decision making process. An explicit consideration of information will aid in the improvement of policy making by suggesting where sources, types and channels can be improved. One recent example is the study by Geiger and Hansen of the United States foreign aid program.[34] Once more, there are benefits for the study of those individuals who are the most influential in particular policy decisions. Such persons would be identified as those who either supply or receive the necessary information. Obviously, information is only one of many sources of influence, and those who transmit and receive it are not the

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34 Theodore Geiger and Roger D. Hansen, "The Role of Information in Decision Making on Foreign Aid" in Raymond A. Bauer and Kenneth J. Gergen (eds.) The Study of Policy Formation, New York: The Free Press, 1968, pp. 329-380.

only people exerting influence. Hence, the method is more reasonably viewed as a supplement to other approaches or as the main approach only for certain types of decisions.

Teachers' Salary Increases

It is possible that the large urban school districts in the northeast section of the country (including Milwaukee) form a cluster in which the salary decisions of any one affect the others. Suburbs in the metropolitan areas of these districts may form secondary clusters based on similar characteristics (geography, income, land use, etc.) Within one a given district should be mainly influenced by the salaries of its comparable neighbors and the central city.

Each suburb in the particular secondary cluster studied may be viewed as going through a two stage decision process. First, the school board attempts to structure the situation using a range for the Bamin based on the highest and lowest salaries selected to date. Suburbs which decide early in the sequence consider the range as a hazy guideline; those settling among the last assume it to be an inviolable boundary.

Next, existing Bamin policy is used to choose a point within the allowable range. Most of the policies represented variations on the theme of emphasizing or deemphasizing the lower end of the schedule relative to the remainder. Such action of course stems from the fact that financial resources even in wealthy suburbs are limited. Emphasis on the lower end is meant to help solve problems associated with the recruiting of new teachers. These included enrollment increases, lack of a reputation with departments of education, a decline in nonpecuniary advantages relative to newer systems, and teachers retiring or leaving for administrative positions elsewhere. It also occurred due to the personal values of school board members. Deemphasizing the lower end was the more frequent situation and happened because enrollment was levelling out, most teachers were in the middle and upper parts of the salary schedule, or the board was determined to attract experienced teachers.

The districts' policies also show the manner in which school boards handle the pressures placed on them by various interest groups. These pressures, arising from teachers, citizens, other boards, and the superintendent force a district to settle neither too high nor too low with respect to its neighbors. Settling too high involves the risk of arousing citizens. It also encourages teachers elsewhere to stand firm which creates problems for their school boards. Settling too low leads to dissatisfied teachers especially if they are admonished by other teachers' groups. It also may affect the quality of the applicants for new positions which is of direct concern to the superintendent. Moreover, it can lead to the necessity for a relatively large salary raise in the immediate future to catch up with the other systems. And citizens react less favorably to sudden tax increases than gradual ones.

This reasoning accounts for the frequent use in the model of the average of earlier settlements. The AVES strategy is similar to giving less than the average increase when a district is currently near the top more than the average increase when it is currently near the bottom, and the average when it is around the middle. It also accounts for the upper and lower limits on increases and explains why structure is sought by means of a range as opposed to other types of patterns. Moreover, the need to reconcile the aforementioned pressures when Milwaukee gives an extremely large increase has led the suburbs to select Bamins which are at most somewhat lower than the central city's.

Besides discussing the factors comprising the model it is also instructive to consider those which were hardly treated or not treated. Due to a lack of data teachers' Bamin requests are not very adequately handled. Where used they are accepted if higher than the initial decision and lower than some allowable upper limit. This implies that a request less than the initial decision will not be compatible with the board's objectives in recruiting for example. However, the board will go somewhat higher than the amount it feels is sufficient in order to satisfy the teachers.

With the exception of the policy break year the model does not consider the effect that other teachers' requests have on salary increases. In particular no relation is developed between fringe benefits and the Bamin. Even though the interviews brought out some instances of tradeoffs it was not possible to compile a history of fringe benefit requests, approvals, and costs. Moreover, tradeoffs may tend to be for relatively small amounts ($50 or less).

The number of new teachers needed for the coming school year is another factor which is not considered to affect the Bamin. Most respondents were of the opinion that it cannot be accurately estimated when salary decisions are made. In addition, there is more concern with the quality of new teachers than their number.

Finally, the applicability of the model to future years and other districts must be considered. It may do a better job of explaining the past than predicting the future. The recent spread of collective bargaining, the growing concern of citizens over taxes, and the extremely large Milwaukee raises are probably leading to fundamental revisions in Bamin policies. At least one of these recent changes, going at most a little below Milwaukee when it gives a large increase, is already incorporated in the model. This rule seems to have had an important influence in the 1969/70 decisions for they closely resemble the 1968/69 choices. Milwaukee went up $500 to $7200, four of the suburbs went to $7150 and two to $7200. The fact that the suburbs came closer to Milwaukee in 1969/70 than 1968/69 can be explained by its increase being $450 less in the former than the latter.

Can the model be used for suburban districts which were not part of the study? It is doubtful that the particular discrimination nets would be applicable elsewhere, but it is likely that the study's general

findings would. Thus, policy breaks associated with major schedule changes, limiting increases in the policy break year, policies based on emphasizing or deemphasizing the lower end of the schedule, establishing allowable ranges, smoothing limits on increases, and use of a strategy similar to AVES should appear in other systems' decision processes.

APPENDIX 1

SUPPLEMENTARY TABLES

Bamin Increases and
Across the Board Increases

	Direct Relation	Partial Relation	Indirect Relation	No Relation
FX PT	5	1	3	0
GLDLE	5	3	0	1
MPDLE	2[A]	2	3	2
NCOLT	3	1	5	0
SHRWD	3	0	5	1
WF BY	5[A]	2	0	2
TOTAL	23	9	16	6

A
In one of these instances increments in the upper part of the schedule were changed.

The Bamin increase was directly related to the raises in all other elements of the salary schedule in 23 out of a possible 54 instances (6 districts x 9 years). This included using the same amount of or percentage increase throughout in a fixed increment type of schedule or basing all raises on the Bamin change in an index schedule. There were 9 cases in which the Bamin raise was directly related to increases in part of the schedule, but the remainder was changed by a larger amount or percent. In 16 instances either increments or index multiples were extensively changed. Here, the Bamin increase was not the sole determinant of other raises. Finally, there were 6 clear cut cases in which no relation existed.

Number of Respondents
to Decision Simulations

	Superintendents	Board Members	Ex Board Members	Total	Number on Board
FX PT	1	2	2	5	5
GLDLE	1	3	0	4	5
MPDLE	1	2	2	5	5
NCOLT	1	1	1	3	5
SHRWD	1	3	0	4	5
WF BY	1[A]	3	0	4	7
TOTAL	6	14	5	25	32

A
The ex superintendent was the respondent since he had recently retired.

Old Policy Vs. New Policy

	Old for New	Old in All Yrs.	No. of Yrs. New Policy
FX PT	1.20	1.42	1
GLDLE	1.86	2.12	5
MPDLE	1.56	1.86	2
NCOLT[A]	-	-	-
SHRWD	1.80	1.84	6
WF BY	3.37	4.37	6
OVERALL[B]	1.60	1.84	

A
No policy break

B
Includes Ncolt

The column headed "Old for New" indicates the ratio of the errors of using the old policy for the new policy to the errors of Model 1. Here, the model's special prediction is used in the break year. The next column shows the errors of using the old policy in the break year and when the new policy is in effect as compared to the model's errors. In all cases the errors are computed over the entire nine years of data. The last column shows the number of years the new policy was in effect. Clearly, the model would have performed much less adequately if it had not switched policies.

APPENDIX 2

BASIC DATA

B.A. Minimum Salaries

	1959/60	1960/61	1961/62	1962/63	1963/64
FX PT	4200	4600	4600	4750	4900
GLDLE	4325	4625	4775	4900	5000
MPDLE	4300	4600	4700	4800	5000
NCOLT	4200	4500	4800	4900	5000
SHRWD	4300	4500	4600	4700	5050
WF BY	4200	4550	4650	4650	5050
MILW	4200	4550	4650	4900	5025

	1964/65	1965/66	1966/67	1967/68	1968/69
FX PT	5200	5350	5550[1]	6100	6700
GLDLE	5200	5450	5600	6000	6600
MPDLE	5200	5400	5450	5900	6600
NCOLT	5150	5350	5550	6000	6700
SHRWD	5200	5400	5600	6000	6750
WF BY	5300	5450	5600	6000	6700
MILW	5275	5400	5550	5850[2]	6800

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1 A couple of months after all the districts, including Fox Point, made their 1966/67 decisions the Fox Point school board awarded its teachers an extra across the board increase of $100. This situation is handled in the following manner. In order to predict 1966/67 Bamins the original Fox Point decision ($5550) is used. When predicting 1967/68 Bamins, Fox Point's 1966/67 decision is considered to be $5650.

2 The 1967/68 Milwaukee increase was $200 starting in January and $100 starting in September.

Teachers' Requests for B.A.
Minimum Salaries

	1960/61	1961/62	1962/63	1963/64
FX PT	4700	4850	5000	4988
GLDLE	4725	4875	5010	5100
MPDLE	----	----	----	----
NCOLT	----	5000	5100	----
SHRWD	4500	----	----	----
WF BY	----	----	5000	5050

	1964/65	1965/66	1966/67	1967/68	1968/69
FX PT	5300	5350	5500	6500	8000
GLDLE	5350	5450	5650	6000[1]	7200
MPDLE	----	----	----	----	6800
NCOLT	----	----	5700	----	7200
SHRWD	----	5450	5600	----	7200
WF BY	5150	5550	5575	6048	7080

[1] The teachers requested the board to select any one of three different Bamins. The model uses as input that request which was the lower of the two in the allowable range. For a definition of the allowable range see the Glendale section of the model.

Settlement Dates

1960/61		1961/62		1962/63	
MILW	10/04/59	MILW	10/03/60	MILW	10/02/61
FX PT	1/05/60	WF BY	2/07/61	WF BY	1/10/62
GLDLE	2/16/60	GLDLE	2/22/61	NCOLT	2/06/62
SHRWD	2/22/60	NCOLT	3/04/61	MPDLE	2/19/62
MPDLE	3/07/60	FX PT	3/14/61	SHRWD	2/27/62
NCOLT	3/08/60	SHRWD	3/14/61	FX PT	3/06/62
WF BY	3/09/60	MPDLE	3/20/61	GLDLE	3/20/62

1963/64		1964/65		1965/66	
MILW	10/01/62	MILW	11/04/63	MILW	10/05/64
MPDLE	2/25/63	SHRWD	1/28/64	NCOLT	2/06/65
NCOLT	2/25/63	GLDLE	3/05/64	GLDLE	2/16/65
FX PT	2/26/63	FX PT	3/10/64	SHRWD	2/23/65
SHRWD	3/05/63	WF BY	3/11/64	FX PT	3/02/65
GLDLE	3/12/63	MPDLE	3/16/64	WF BY	3/10/65
WF BY	3/13/63	NCOLT	3/17/64	MPDLE	3/22/65

1966/67		1967/68		1968/69	
MILW	11/01/65	MILW	12/26/66	MILW	12/03/67
FX PT	1/25/66	FX PT	1/10/67	WF BY	2/14/68
SHRWD	1/25/66	WF BY	2/08/67	MPDLE	2/26/68
MPDLE	2/21/66	GLDLE	3/09/67	GLDLE	2/27/68
NCOLT	2/21/66	MPDLE	3/13/67	SHRWD	3/26/68
WF BY	3/09/66	NCOLT	3/20/67	FX PT	4/09/68
GLDLE	3/15/66	SHRWD	3/21/67	NCOLT	5/07/68